THE OTSM-TRIZ HERITAGE OF
Nikolai N. KHOMENKO
(TRIZ Master #59)
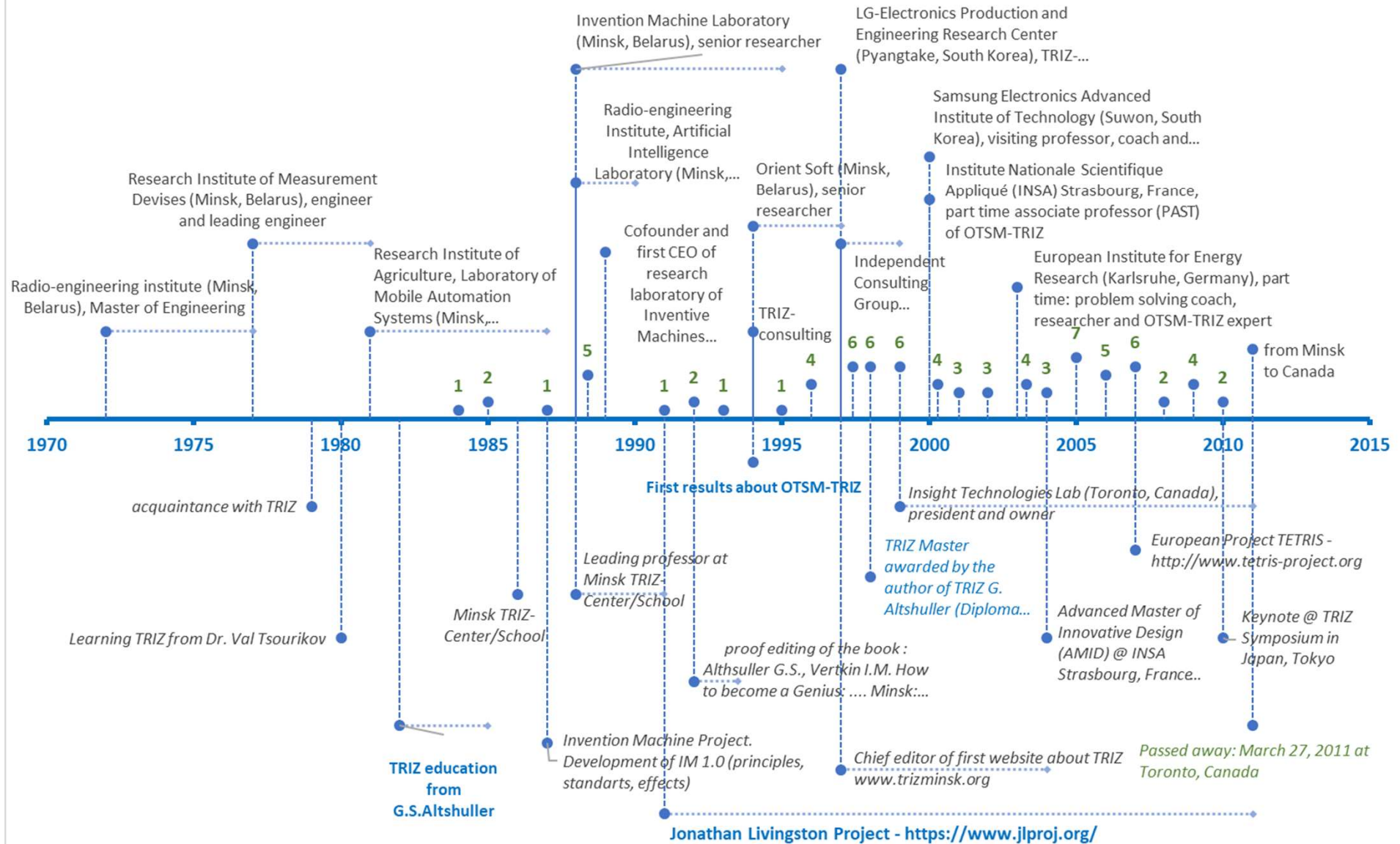
KURYAN Andrei, KUCHARAVY Dmitry
St. Petersburg, June 2018

Who is Nikolai Khomenko?

- First acquaintance with TRIZ –in 1979-80 First teacher – Val Tsourikov.
- Research about ARIZ that have finished up with new notion of Classical TRIZ – Resources. 1982-1984. Invitation from Altshuller for his training.
- Individual education from Genrich Altshuller 1983-1998. Subject: Why TRIZ named a theory? That is why my perception of TRIZ is so different.
- OTSM Research and Development since 1985.
- Leader of Minsk TRIZ school 1986-1998.
- Co-founder of Invention Machine Laboratory 1989. Member of the board and System architect for versions of IM 1.0 and IM 1.5.
- Founder and leader of the Jonathan Livingston Project since 1991.
- First Russian TRIZ expert invited to South Korea in 1997 by LG Production Research Center (LG-PRC). In 2000 invited by Samsung Advanced Institute of Technology (Samsung SAIT).
- Founder of Insight Technologies Lab, 1999, Toronto, Canada.
- Scientific Director of an unique educational program Advanced Master in Innovative Design. INSA Strasbourg, France, 2004-2009.
- Part time OTSM coach at European Institute for Energy Research (EIFER) 2004-2009, Karlsruhe, Germany.
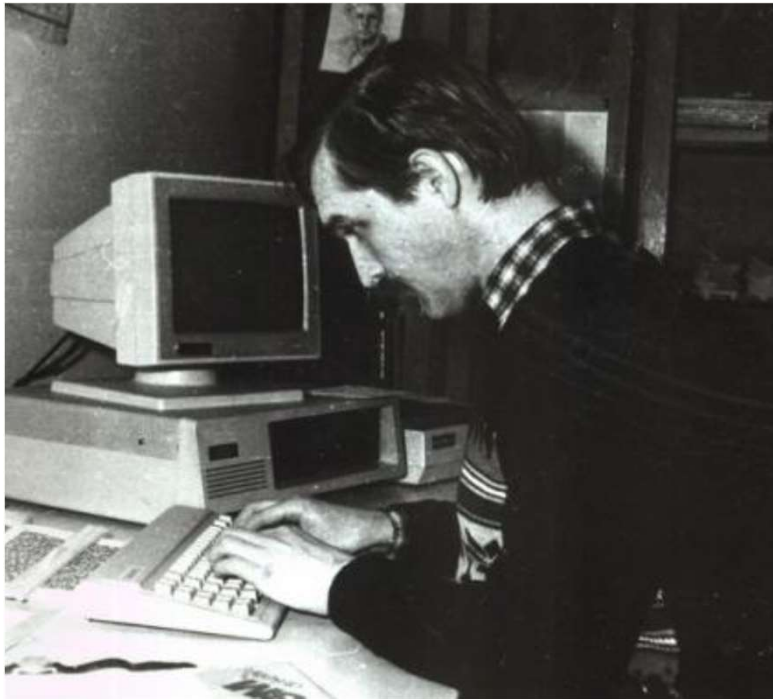
N. Khomenko. Keynote presentastion for
6th TRIZ Symposium in Japan, Tokyo

Minsk (USSR & Belarus), 1979 - 1997

Memories of Nikolay Shpakovsky – Minsk, 1980-1987

➢ 1980. Beginning of professional career at Agricultural Research Institute and acquaintance with Nikolai Khomenko.

➢ 1981 - 1983. Joint project on plow improvement. Nikolay Khomenko taught me how to apply inventive problem solving techniques to real cases.

➢ 1983 – 1987. Joint project on a soil leveling machine. Learning TRIZ at Minsk TRIZ-Center/School, where N.Khomenko was a leading tutor.

When working on the joint projects at Agricultural Research Institute we often held informal discussions on the matter. Nikolai shared some ideas on using TRIZ methods and tools in practice. Later on I understood that those discussions were his first experience in teaching OTSM-TRIZ.

[Nikolay Shpakovsky, 2018]

Science laboratory 'Invention Machines'(Minsk, Belarus)

- ➢ 1987 - 1989. Working together with Evgeni Leskovec and Andrei Kuryan on the first prototype of the Invention Machine platform using a personal computer in V.Tsourikov's apartment.

- ➢ 1989. Co-founder of NILIM. Board member of NILIM.

- ➢ 1989 - 1990. System architect of the Invention Machine (IM) 1.0. project.

- ➢ 1990 – 1991. Developing IM-ARIZ prototype. Team leader of the research group that included Andrei Kuryan and Andrei Solovei. Conducting first experiments with hyper-texts and scenarios of human-computer dialogues.

- ➢ 1991 – 1993. System architect of the Invention Machine 1.5. project. Experimenting with the model 'Element – Name of Feature – Value of Feature' (ENV)

- ➢ 1987-1988. Acquaintance with N.Khomenko at Minsk TRIZ-Center/School.

- ➢ 1988-1992. Joint projects at NILIM and later at IM-Lab on the Invention Machine project.

- ➢ 1994 - 1996. Joint consulting projects in Minsk, Belarus.

- ➢ 1997 – 2004. Developing and maintaining together the http://www.trizminsk.org/ website.

- ➢ 2001 – 2006. Joint research, consulting and educational projects at INSA Strasbourg. Joint projects in different countries (France, Germany, Italy, Mexico).

Nikolai was open and selfless when helping people to learn about OTSM-TRIZ. He did not tolerate hypocrisy or back-door solutions. Sometimes he seemed a bit naïve at the first glance but was firm in defending his point of view. Between 1997 and 2004 we held a lot of discussions and shared teaching and research results. He often invited me to join his projects. My projects were always less ambitious. Later on my research interests shifted from problem solving to forecasting and we discussed our research results less. Nikolai helped me enormously in professional and personal development. I am grateful to him!

[Dmitry Kucharavy, 2018]

Memories of Igor Devoino – Minsk, 1976 – 1993

➢ 1976. Acquaintance with N.Khomenko.

➢ 1980's. Teaching together. Spending leisure time together in the apartment of V.M.Tsurikov.

➢ 1987 - 1993. Joint work in IM-Lab. Joint consulting projects at the "Minsk Motor Plant", plant "Horizont"

In the 1980s (before IM-Lab) and then in IM-Lab we talked a lot about TRIZ techniques and especially about ARIZ. We regularly discussed problem formulation methods. We often participated in consulting projects and training seminars on TRIZ as co-facilitators. Nikolai Khomenko laid the foundation for the systemic approach to problem analysis; he formed and developed teams of OTSM-TRIZ teachers who adopted his ideas.

[Igor Devoino, 2018]

Memories of Andrei Kuryan – Minsk, 1987-1993

- ➤ 1987. Acquaintance with N.N.Khomenko. Joint work on the prototype of Invention Machine project (0.1)

- ➤ 1988. Studying TRIZ at Minsk TRIZ-Center/School where N. Khomenko was teaching.

- ➤ 1989 - 1990. Working together with N. Khomenko and Andrei Solovei on the developement of the IM-ARIZ 1.0 system.

- ➤ 1991 – 1993. Developing the IM-Algorithm 1.0 system together with N.Khomenko

- ➤ February, 2011. Last meeting in Minsk. Discussing OTSM-TRIZ

I remember Nikolai Khomenko as a very approachable and kind person, a great teacher who tried to explain complex things in simple words till they became fully clear. He was an excellent colleague who generously shared his experience in TRIZ and actively sought the expertise and experience of his colleagues in the field of information technology and artificial intelligence. These character traits helped Nicholai to develop OTSM-TRIZ, in particular when he worked on the development of OTSM-TRIZ models and tools that incorporate the organic synthesis of knowledge from different disciplines and industries.

[Andrei Kuryan, 2018]

Nikolai was my "godfather" in TRIZ. He and Valery Tsourikov were the first TRIZ-specialists I met in 1989.

That meeting made a huge refreshing impression on me. This is due to the fact that just before the meeting I attended a scientific conference where my presentation was highly praised. But, on the whole, that conference was quite boring, in contrast to a lively, exciting work I saw in Minsk! At the same meeting, Nikolai gave me books that I could not find anywhere else. He gave me addresses of the most active TRIZ-specialists providing their brief characteristic, specifying who was particularly strong in which domain and what their professional and personal qualities were...

...We began to communicate more often when I started working in South Korea. Nicholai was interested in the details of the local development. His memories of starting work in this particular region (that looked like a blind-alley at that time) were very useful. The toasts to Nikolai Khomenko – to the TRIZ-pioneer in South Korea - were often raised at the co-Russian TRIZ-gatherings. I don't know all aspects of wide and extensive activities of the "godfather". Judging by the results, Nicholai was also a TRIZ-pioneer when working in Strasbourg. He was acting with the same energy when promoting 'children's TRIZ' outside the CIS.

There are very interesting web sites initiated and/or made by him.

[Naum Feygenson, *2011 / metodolog.ru*]

Memories of Boris Zlotin and Alla Zusman

2006-05-17

Chisinau TRIZ School, Ideation Inc. and we personally owe Nikolay Khomenko a great deal.

From the end of the 80's we tried to make a software product based on a new understanding of TRIZ and computerization of TRIZ. But our software developers could not make what we needed. They just couldn't understand us.

At the beginning of 1992, we held a seminar in Simferopol for our TRIZ colleagues (something like "advanced training"). We complained that our software developers could not do what we needed. Nick said - "You just need the hypertext ..." And he didn't merely tell us what it was, but also showed how to enter the helps of the MultiEditor program (that was popular at that time) and replace them with our own screens.

Thus, thanks to him, in just one month we were able to make the first fully functional version of "Manager's Toolkit" program that sold well in the former USSR and became the basis for all future software of Ideation Inc. ... Nick divined the future very well! After a few years, the HTML-based (HyperText Markup Language) Internet began to spread rapidly!
So Nick became the "godfather" of all our software. Then we parted ways but we are always grateful to him for everything he did for us ...

[Boris Zlotin and Alla Zusman, 2011 / metodolog.ru]

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South Korea (1997... 2009)

South Korea 1997 - 2003

2000-03-14

1997- **LG-Electronics** *Production and Engineering Research Center* (Pyangtake, South Korea), TRIZ-expert in problem solving, leader of "troubleshooters" research group

1999 - *LG-Electronics Learning Center* (Pyangtake, South Korea), visiting trainer

2001: teachers and students, Samsung Electronics

2000- 2003 **Samsung Electronics** Advanced Institute of Technology (Suwon, South Korea), visiting trainer and coach in Knowledge Management for problem solving

Memories of Nikolay Shpakovsky

➢ June, 2000. Building TRIZ team that included Hyo June Kim and Nikolai Shpakovsky. The TRIZ team dealt with process/product design projects and problem solving.

➢ November, 2000. Vasily Leniachin jointed the TRIZ-team.

➢ During 2000 – 2002 every two months N.Khomenko facilitated OTSM-TRIZ training courses and problem solving workshops at Samsung.

➢ December, 2002. Nikolai Shpakovsky quit Samsung

N.Khomenko's interventions provided powerful impulses and contributions for practical projects and for inventive problem solving.
During his visits we had lots of fruitful discussions about OTSM-TRIZ with Nikolai Khomenko, Vasili Leniachin.

[Nikolay Shpakovsky, 2018]

November 2002: TRIZ specialists from the USSR after a seminar, Seoul, South Korea

February 1999: a group of students of the first 5-day seminar on ARIZ-85C, LG-Electronics Learning Center

Award given to N.Khomenko by the Samsung Advanced Institute of Technology

France (1999… 2010)

Advanced Master of Innovative Design (AMID)

Training program based on the Theory of Inventive Problem Solving (TRIZ) and on the General Theory of Powerful Thinking (OTSM-TRIZ)

406 teaching hours (theory, practical sessions and group work) :
- eleven 35-hour units and
- one 21-hour methodology seminar, focused mainly on describing and analyzing work linked with the professionally oriented theses.

who was concerned?
- Researchers
- Holders of a MASTER, or equivalent post-graduate degree
- Engineers in design offices
- Experienced consultants

2005, team of teachers/instructors, INSA Strasbourg, France

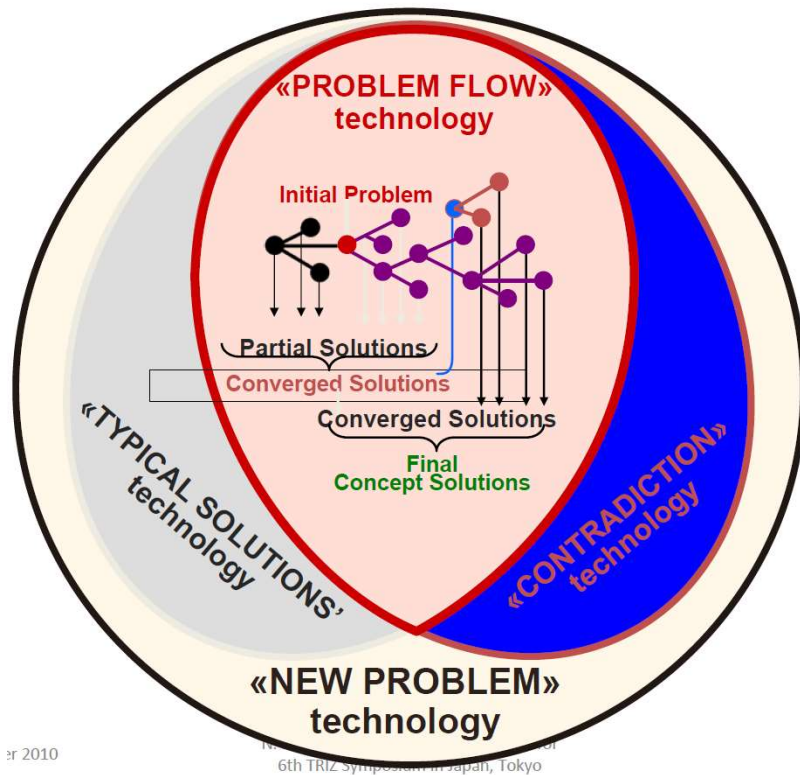# Advanced Master of Innovative Design (AMID)

2004, 2006, 2010: students and teachers

Created in 2004: the Master's degree in innovative design has received the accreditation of the *Conférence des Grandes Ecoles**.

- Nikolai Khomenko participated in the project from 2002 to 2009
- From 2004 to 2011: 52 students including 9 PhD students & 2 academic researchers.
- 2006: 23 students (2 groups) in Monterrey, Mexico in "Mastering Classical TRIZ and OTSM"

"Advanced Master in Innovative Design, remains by this day the highest diploma related to TRIZ and OTSM that is formally recognized by the education authority." – Denis Cavallucci, 2018

«PROBLEM FLOW» technology

Initial Problem

Partial Solutions
Converged Solutions
Converged Solutions
Final Concept Solutions

«TYPICAL SOLUTIONS» technology

«CONTRADICTION» technology

«NEW PROBLEM» technology

1999: © N. Khomenko – Basic technologies of OTSM-TRIZ

"The course has forced the biggest change in years in my way of approaching problems and analyzing them.
The majority of the innovative solutions proposed by the method are better adapted to a research context where no solution is known, then to an industrial context where the desire is to reduce the cost of well-known solutions.
Nevertheless, the problem analysis tools are extremely powerful in all situations.
Over time I have noticed that the effects of the change in mentality are growing rather than fading away."

- Chris RHODES, Arvin Meritor Company

Some results (1999-2009)

Titles of some PhD theses:

- 2003 - Contribution to the definition of contingent processes in the development of information systems: Proposal of an approach oriented towards the identification of key problems

- 2004 - Contribution to the formulation of design problems for technical systems. Study based on the TRIZ.

- 2005 - Contribution to the integration of regular and inventive approaches in design. Application to the injection of thermoplastics

- 2009 - Help in the management of innovation activity through the approach of problem networks: Application to the problem of integration of Marketing and R & D services

Titles of some Master Projects within AMID*:

- Application of OTSM-TRIZZ theory to design the Business Model on Self Publishing on demand

- Case Study of a LPG powered soldering Iron

- Strategies of SMEs to formulate collaborative innovation projects with R&D laboratories

- Improvement of the batch record process in the pharmaceutical industry

- Wiper blade creativity (automotive industry)

- Thin Tank Project: Fuel storing and delivering system

- Products for Cross-Border Traffic, Bombardier

- Dye Solar Cells: Application of TRIZ to increase their efficiency

* Advanced Master of Innovative Design – more than 400 hours training program based on OTSM-TRIZ at INSA Strasbourg, France (2004-2011)

OTSM-TRIZ in education

Memories of Ingrīda Muraškovska

➢ 1987: Acquaintance with N. Khomenko

➢ 1992-1994: Meetings during TRIZ conferences and collaboration within TRIZ-CHANCE working group

➢ 1999–2003: Regular collaboration within the Jonathan Livingston project

➢ 2008–2009: Collaboration within the European project TETRIS

Regular discussions with Nikolai Khomenko allowed me to improve my understanding of OTSM-TRIZ, as well as to see the possibilities of applying it to the educational domain.
Joint publication: I.Murashkovska, N.Khomenko. Third millennium: driving contradiction and other problems of education. In the book: TRIZ-Pedagogy. In the series: New Educational Value. Moscow. Russia 2003. ISSN 1726-5304

Being helped by N.Khomenko I used the Problem Flow technology for my research "Investigation of Adults Lifelong Learning". I successfully defended my doctoral thesis in 2013 at the University of Latvia (Riga). Twice N.Khomenko organized my seminars for teachers in Minsk, Belarus.

[Ingrīda Muraškovska, 2018]

Memories of Alla Nesterenko

- ➢ 1987: Acquaintance with N. Khomenko during TRIZ Conference, Petrozavodsk, Russia

- ➢ 1988-1997: Encounters during seminars in Petrozavodsk, Russia.

- ➢ 2002: Strasbourg. Conference and internship at INSA, Strasbourg, France.

- ➢ 2009: Last meeting in Minsk, Berlarus

- ➢ 2011: Last talk via Skype

We did not have a lot of business correspondence. I rarely wrote letters during 10 years while I had an experimental class. Later, we basically discussed all the questions face to face. I discussed his texts either with colleagues or with him. I also tried to edit his texts, and there was correspondence on this subject.

I consider that the most useful for me was the fact that he sent his texts for discussion and reviewed my texts. As a result, the system of models for problem-oriented learning (I used in my thesis and I am still working with) was developed on the basis of the ideas that I got from N. Khomenko. In recent years, I almost do not do scientific research, but I am mostly engaged in practice. Meanwhile, when I need to solve a fairly common problem (for example, to understand how to work with contradictions in pedagogy, or to plan the development of the educational system) I use OTSM. This is perhaps because it is the most comprehensive approach for me as a teacher. This approach is lively and not superficial.

[Alla Nesterenko, 2018]

Memories of Tatiana Sidorchuk

- ➤ 1994: Acquaintance with N. Khomenko during TRIZ Conference, Petrozavodsk, Russia

- ➤ 1994-2011: Continuous collaboration with N. Khomenko on adapting OTSM-TRIZ models to the preschool educational practice.

In cooperation with Nikolai Khomenko we developed a SYSTEM for using the OTSM-TRIZ models for development of cognitive/speech skills of preschoolers. These methods have been used in pre-schools in Russia and have been regularly showing good results.

Jonathan Livingston was the main joint project. Every year we held seminars with Nikolai for pre-school teachers (Samara, Ulyanovsk, Khanty-Mansi Autonomous Okrug - Yugra: Nyagan, Yugorsk, Cherepovets, Chelyabinsk, in Russia, Minsk, Belarus etc.). N.Khomenko helped me to prepare my keynote presentation for the TRIZCON2006 conference (USA, Milwaukee, 2006). In 2007 he initiated and supported my projects in South Korea. N.Khomenko translated and prepared for publishing the book 'Thoughtivity for Kids' (by Sidorchuk T., and N. Khomenko, 2006).

[Tatiana Sidorchuk, 2018]

Memories of Alexander Sokol

- ➢ Beginning of 1990s - formal acquaintance with Nikolai during one of the TRIZ conferences in Russia
- ➢ 1997 – start of regular online correspondence with Nikolai (fragments reflected at www.otsm-triz-letters.org)
- ➢ 2000 – first real face-to-face meeting during the OTSM-TRIZ mini-conference in Warsaw, Poland
- ➢ 2001-2009 – multiple meetings with Nikolai during my PhD project in Strasbourg, France as well as in various other contexts (Vinci and Trieste, Italy; Jelgava, Sigulda and Riga, Latvia; Nuremberg, Germany)

I believe Nikolai Khomenko made a significant impact both on my understanding of TRIZ and further professional activities. My own research in education that started around 1997 was largely based on OTSM-TRIZ. In this respect, I am sure that communication with Nikolai affected the development of the Thinking Approach to language teaching and learning that I authored with a number of colleagues. Nikolai was never indifferent to my academic education. He was also ready to discuss various drafts of my papers, starting from the bachelor level and up to the PhD thesis. In fact, the opportunity to obtain a diploma in Strasbourg was to a large extent the result of Nikolai's activities who proposed to the local colleagues to get in touch with me when the interest in applying TRIZ to non-technical fields emerged.

[Alexander Sokol, 2018]
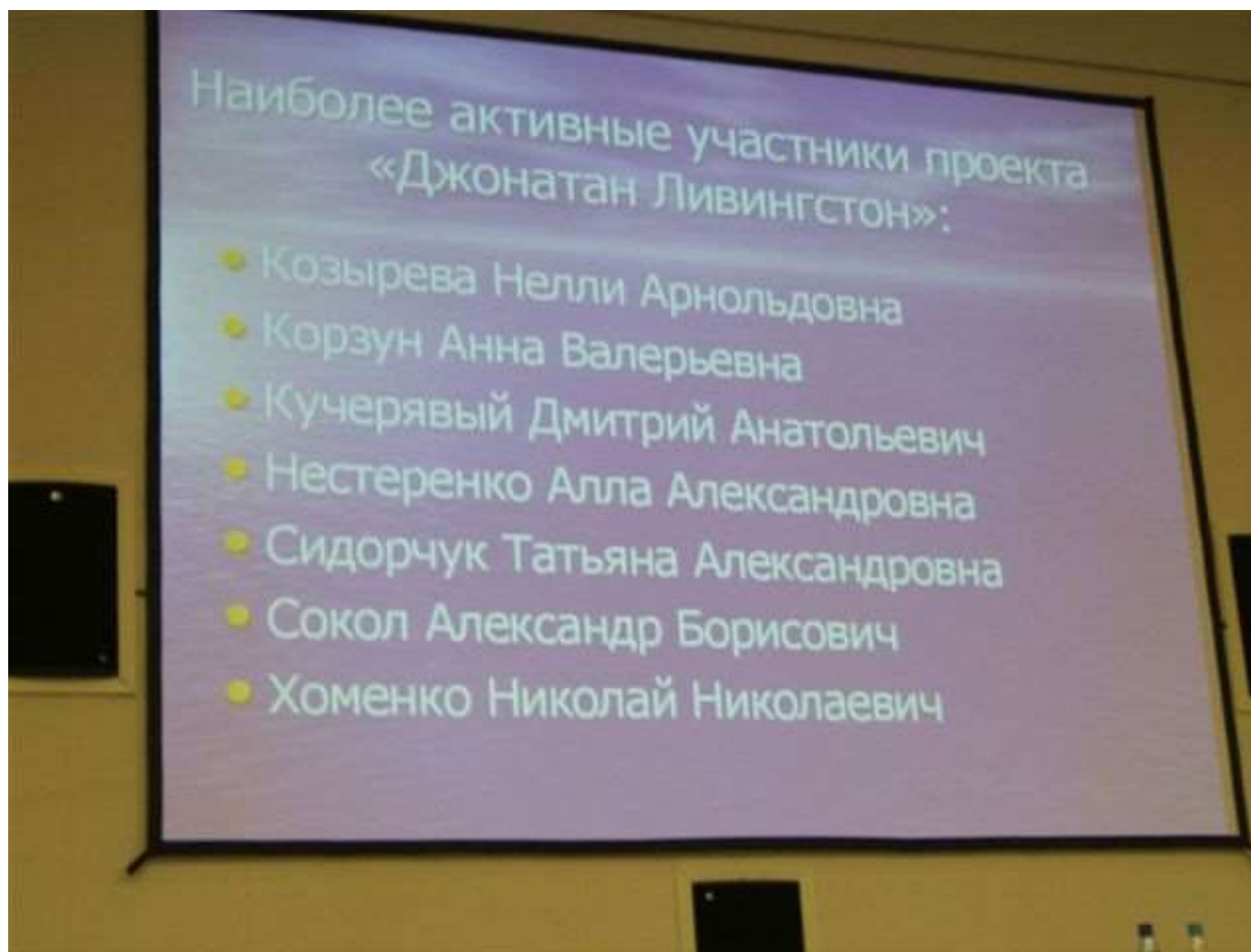
The Jonathan Livingston project (Ingrīda Muraškovska)

The project was initiated by Nikolai Khomenko in 1999. He invited his colleagues to participate in this project : Dmitry Kucharavy, Anna Korzun, Alla Nesterenko, Tatyana Sidorchuk, Ingrida Murashkovska, and Alexander Sokol.

The team was cooperating mostly via e-mails, messengers and chats. During those discussions we achieved a deeper understanding of OTSM-TRIZ, models, concepts and their applications. One of the main objectives was to develop an e-tutorial on OTSM-TRIZ. This work was not finished.

Most of the materials were published on http://www.trizminsk.org – the website of OTSM-TRIZ Technologies Center.
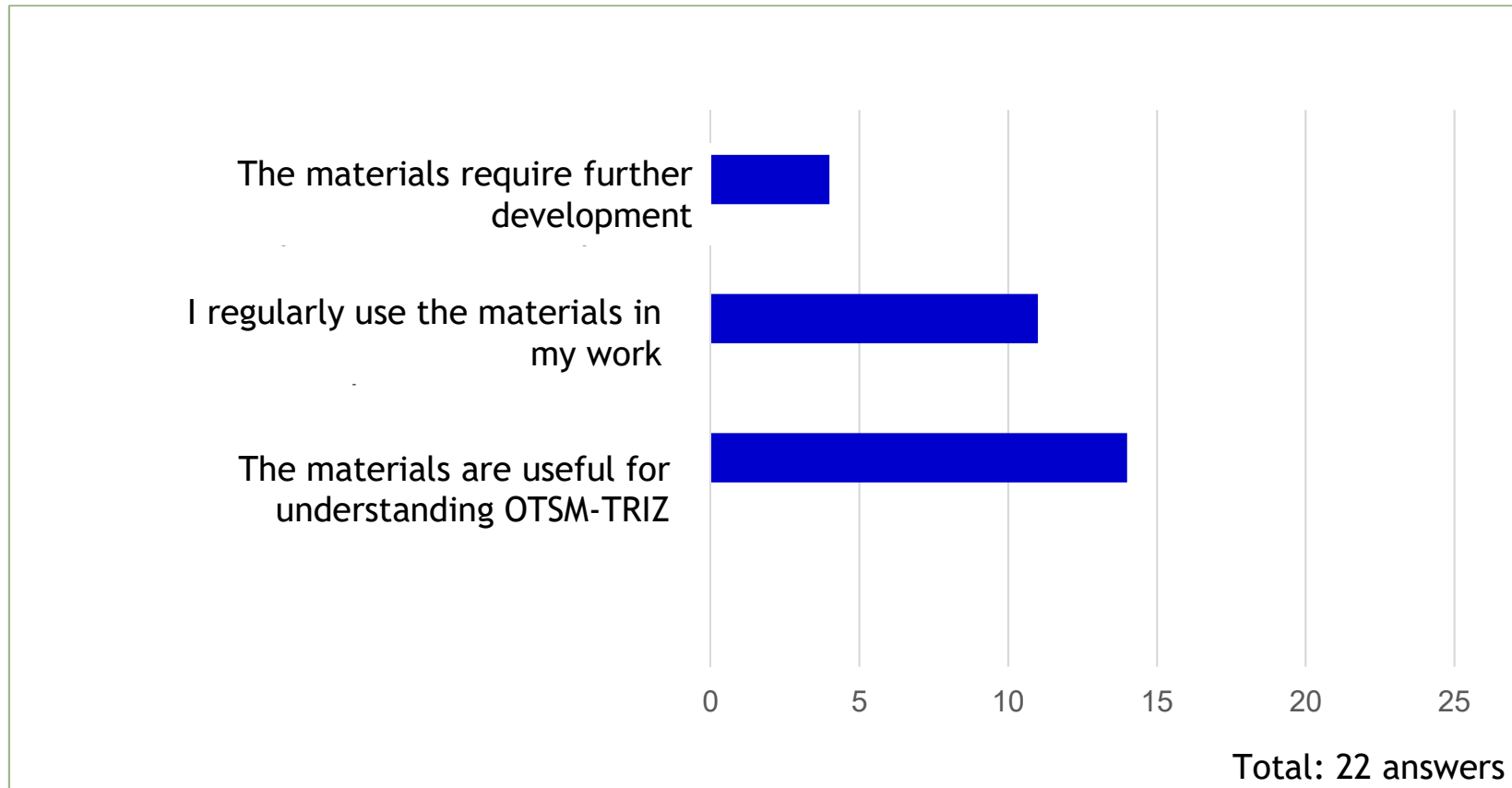
In this project Nikolai Khomenko was trying out a new form of collaboration. This form of collaboration was based on self-organization and non-linear networking principles. You can find some details about the project on http://www.trizminsk.org/e/jl.htm (in Russian).

I left the project in 2003 for personal reasons. As I know, the project has been active for some time, but gradually the connections between the participants weakened and they began to switch to independent projects with or without N. Khomenko. Later, Alla Nesterenko became the editor of the new project's website https://jlproj.org , Alexander Sokol created TA-Group and started to develop European projects on the basis of OTSM-TRIZ, etc.

2005: a list of active participants of the Jonathan Livingston project:
Nelly Kozyreva, Anna Korzun, Dmitry Kucharavy, Alla Nesterenko, Tatyana Sidorchuk, Alexander Sokol and Nikolai Khomenko

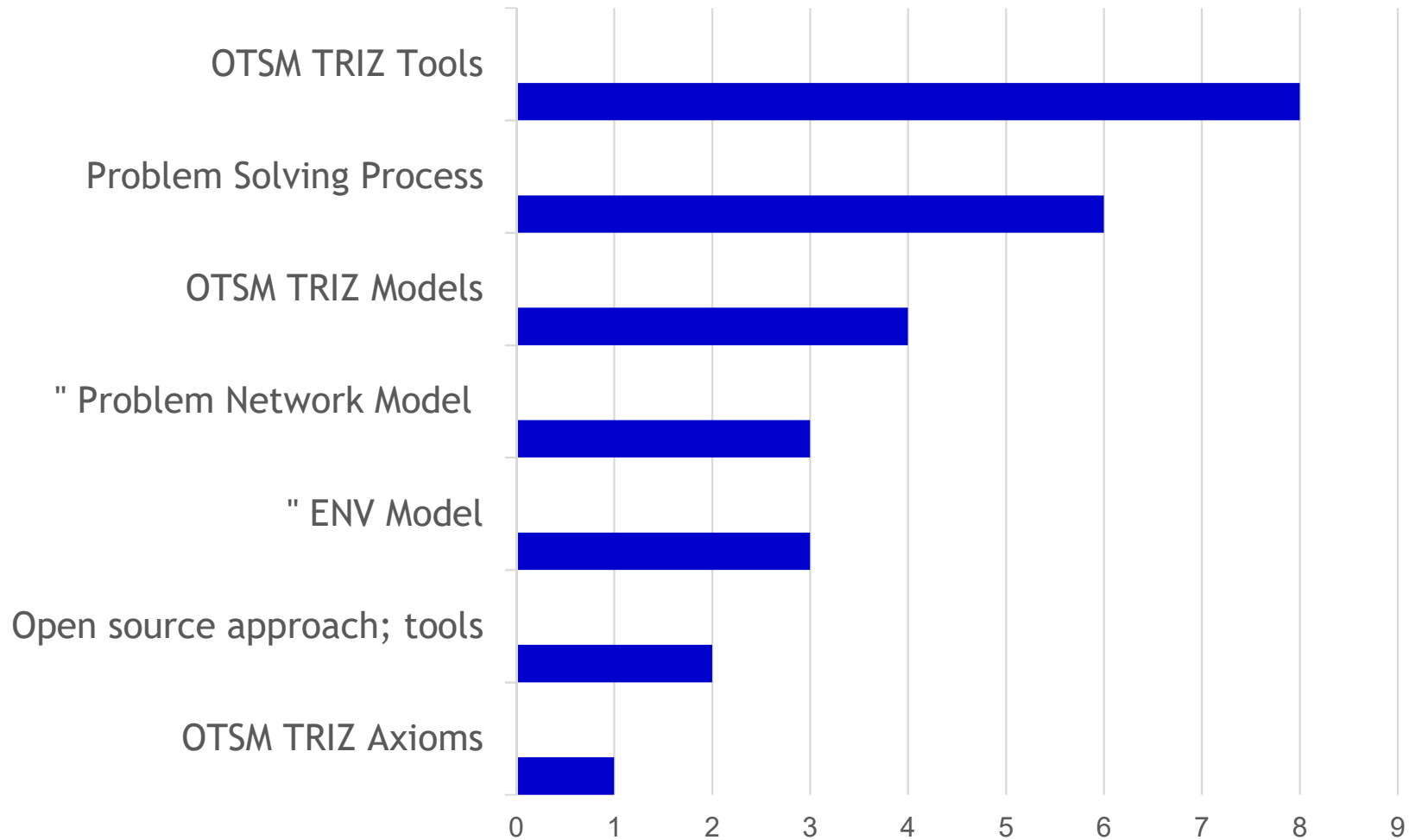# The Jonathan Livingston Project, Materials (publications, methods)

The materials require further development

I regularly use the materials in my work

The materials are useful for understanding OTSM-TRIZ

0   5   10   15   20   25

Total: 22 answers

OTSM-TRIZ -
General Theory of Powerful Thinking

Survey participants

1. Bohuslav Bušov, Doc. Ing. Brno University of Technology / Czech Republic
2. Denis Cavallucci, Head of CSIP research Team - UMR-CNRS 7357 / Strasbourg, France;
3. Irina Volodina, design engineer "Gomselmash" / Gomel, Belarus;
4. Marat Gafitulin, TRIZ Master #14, PhD, business-consultant / Moscow, Russia ;
5. Roland De Guio, Full Professor of Industrial and Production Engineering, INSA Strasbourg, France;
6. Igor Devoino, TRIZ Master #73 / Minsk, Belarus;
7. Yves Guillou. TRIZ trainings, INSA, Strasbourg, France;
8. Igor Kaikov; TRIZ specialist, consultant / Ettlingen, Germany;
9. Andrei Kuryan, TRIZ trainer, manager of innovative teams, EPAM Systems / Minsk, Belarus;
10. Dmitry Kucharavy, researcher, scholar, consultant / Strasbourg, France;
11. Ingrīda Muraškovska, TRIZ education / Latvia;
12. Alla Nesterenko, TRIZ specialist (IV level), TRIZ educator / Russia
13. Georgy Severinets, TRIZ Master #98 / Belarus-China;
14. Alexander Sokol, TA Group / Riga, Latvia;
15. Tatiana Sidorchuk, TRIZ specialist (IV level) / Ulyanovsk, Russia;
16. Naum Feygenson, TRIZ Master #72; En+ group / Moscow, Russia;
17. Natalya Chigevskaya, TRIZ teacher / Minsk, Belarus;
18. Oleg Shmigelsky, specialist in TRIZ and VEA, Lean practitioner / Minsk, Belarus;
19. Nikolay Shpakovsky , TRIZ Master #69 / Minsk, Belarus;
20. Hongyul Yoon, TRIZ Master #96, TRIZ Center / South Korea.

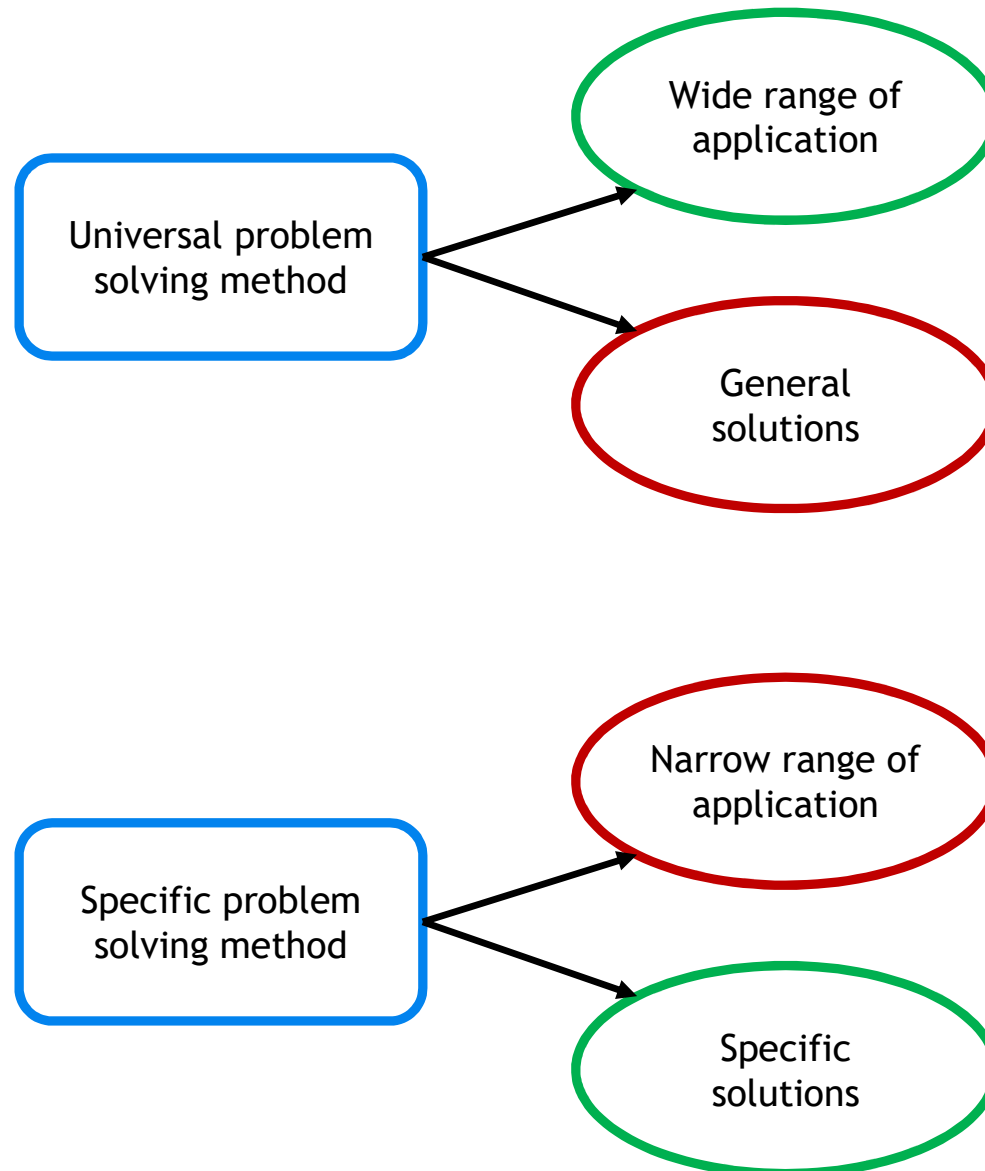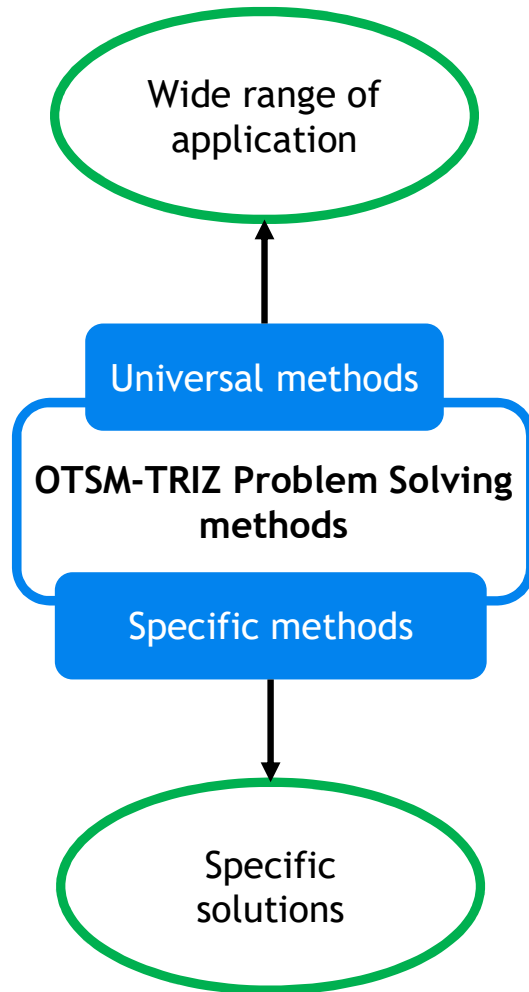# From your viewpoint, what are the most interesting research results of Nikolai Khomenko?

Category	Value
OTSM TRIZ Tools	8
Problem Solving Process	6
OTSM TRIZ Models	4
" Problem Network Model	3
" ENV Model	3
Open source approach; tools	2
OTSM TRIZ Axioms	1

Total: 14 answers

KEY PROBLEM OF OTSM-TRIZ

Wide range of application

Universal methods

OTSM-TRIZ Problem Solving methods

Specific methods

Specific solutions

In order to be universal, the rules of problem solving methods should be as general as possible. But the more general the rules of the problem solving are, the more general and the less practical the solution will be.

And vice versa: when the rules (and methods) are specific and precise, they are helpful for solving a specific problem which is of the practical use. However, the more specific they are the less universal they are as well.

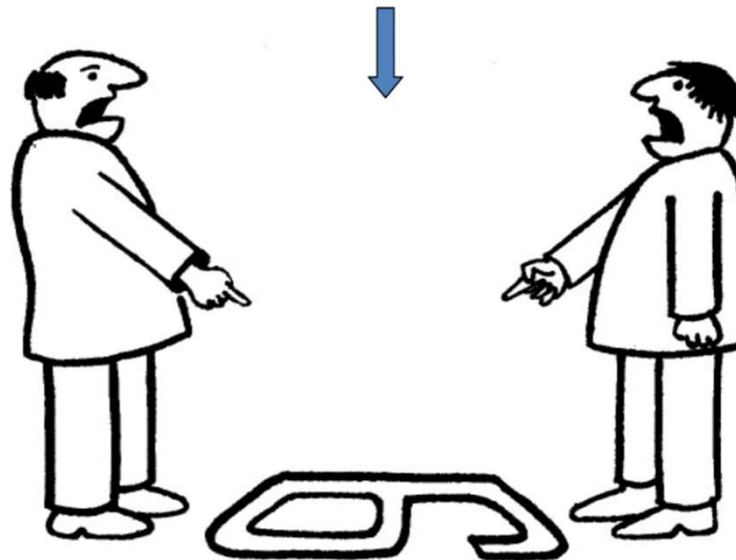*N. Khomenko. Keynotes for 6th TRIZ Symposium in Japan, Tokyo. September 2010.*

OTSM AXIOMS

There are different ways to describe the world around us.
There is an infinite number of ways to describe the world.

N. Khomenko, R. De Guio. *2010. OTSM System of Axioms*

Which Model is better?

Root-Cause of many Disagreements and problems:

Nobody is wrong! Everybody describes their perception about
something from their own standing point.
OTSM provides a solution – OTSM Network of Problems.

© Nikolai Khomenko. Keynote presentation for 6th TRIZ Symposium in Japan, Tokyo. September, 2010

Any element should be seen as a process and vice versa.
This process, which is linked with a human being as soon as we are in a problem solving context, evolves in accordance with objective laws and takes into account specific objective and subjective factors.

N. Khomenko, R. De Guio. *2010. OTSM System of Axioms*

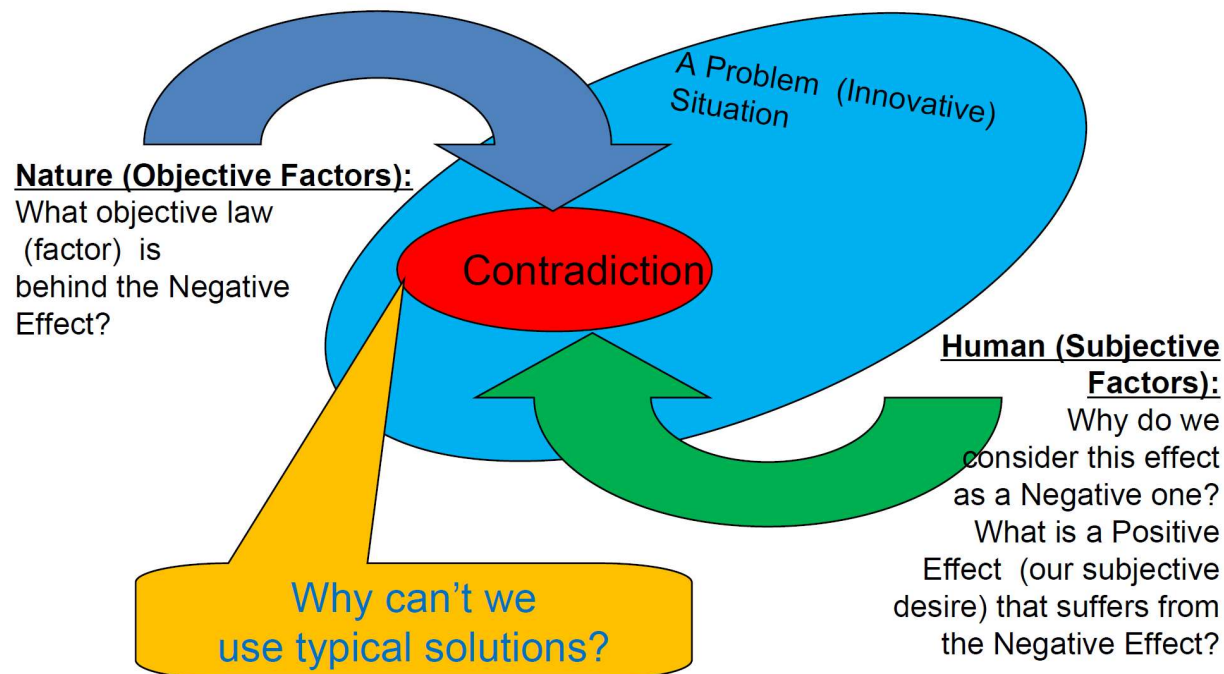Modern approaches in system and business engineering related to processes:
- Technology maps;
- Flow models;
- Business process models;
- Product life-cycle models;
- Phylogenies & ontogenies in the system operator (M. Rubin)

Axiom of impossibility. In order to overcome psychological inertia during a problem solving process, it is necessary to accept (temporarily) the assertions, the logical value of which seems "false" at a first glance, and analyze the consequences of these assertions.

Axiom of the core of any problem. Any problem can be stated as a contradiction between our subjective desires for something appearing in a specific context on the one hand, and objective laws that cause this specific situation, one the other hand.

Art of Victory:
OTSM Axiom of the Core of our Problems

A Problem (Innovative) Situation

Nature (Objective Factors):
What objective law (factor) is behind the Negative Effect?

Contradiction

Human (Subjective Factors):
Why do we consider this effect as a Negative one? What is a Positive Effect (our subjective desire) that suffers from the Negative Effect?

Why can't we use typical solutions?

THE AXIOM OF INDEPENDENT OBSERVERS

Any perceived problem is a transcription of a situation from the point of view of the person who is involved in the problem. In order to overcome the problematic situation; it is necessary to get out of the role of the problem "owner" and analyze the situation from different points of view.

1. *The point of view of the problem solver, namely, the person directly working on the problem.*
2. *The point of view of the regulator, namely, a person who checks the formal side of the application of rules of OTSM methods and technologies.*
3. *The point of view of the judge who tries to understand the disagreements between the problem solver and the regulator.*
4. *The point of view of the referee who tries to understand the world vision of the problem solver, the regulator and the judge when they interact.*

N. Khomenko, R. De Guio. *2010. OTSM System of Axioms*

Modern approaches to stakeholder analysis in system engineering and TRIZ:
- Stakeholder analysis;
- Analysis of Stakeholders' requirements;
- Contradiction in requirements (M. Rubin).

THE AXIOMS OF WORLD VISION

Axiom of Unity. The world is a whole and unique system that evolves in accordance with objective laws of all the sub-systems.

Axiom of Disunity. The world is a set of different systems, each of them evolving in accordance with its specific laws.

Axiom of Connectedness Unity and Disunity. The way the law is manifested in a specific situation is defined by its resources.
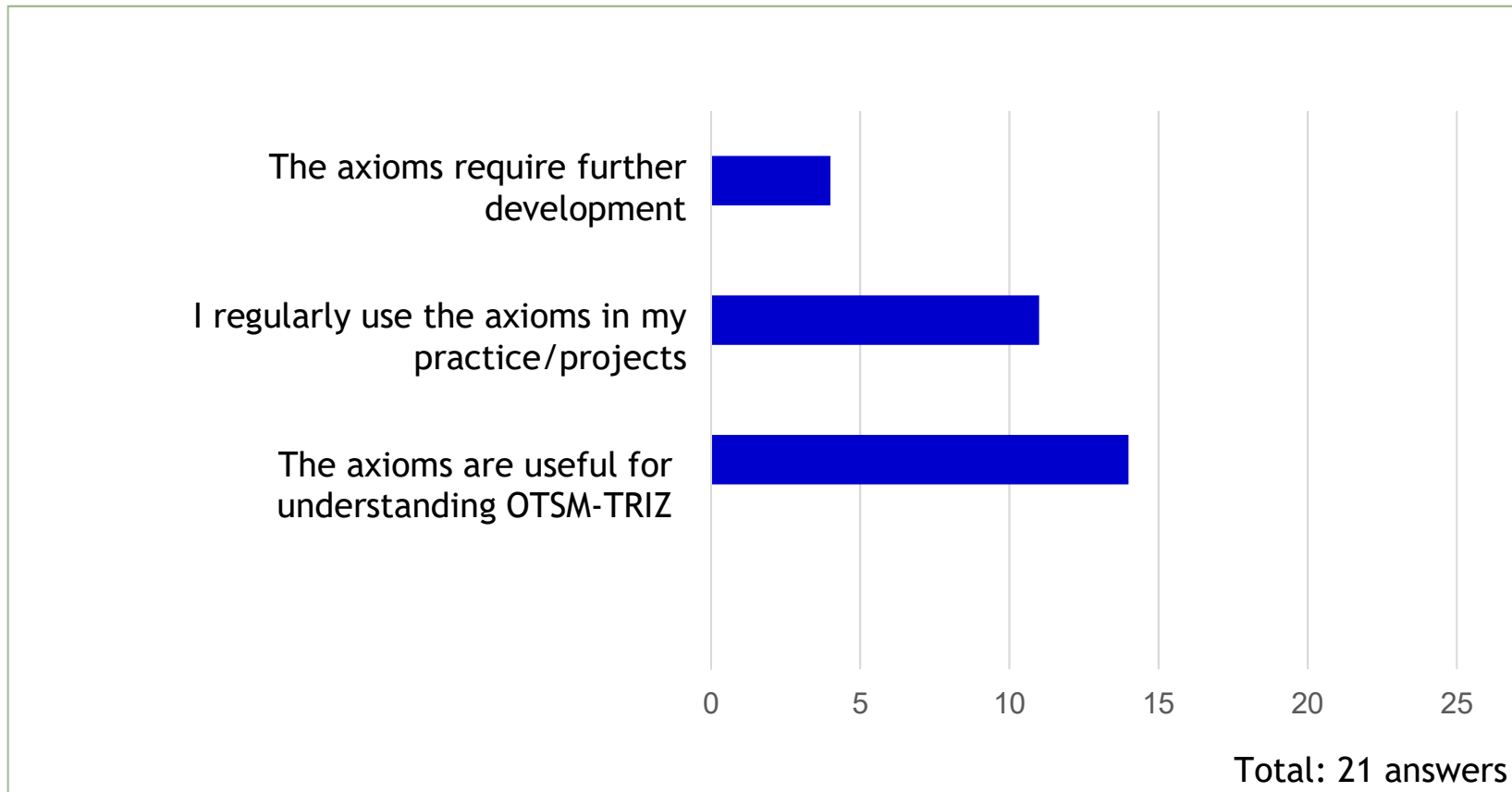
Consequences:
Unity and diversity of the world are governed by the resources used by different systems. Any resource is subject to both general laws and specific laws defined by their specific properties.
General objective laws are manifested differently in specific situations. This difference depends on the nature of the interplay between the law and the specificity of the situation.

N. Khomenko, R. De Guio. *2010. OTSM System of Axioms*

What is your opinion about the OTSM-TRIZ axioms?

The axioms require further development

I regularly use the axioms in my practice/projects

The axioms are useful for understanding OTSM-TRIZ

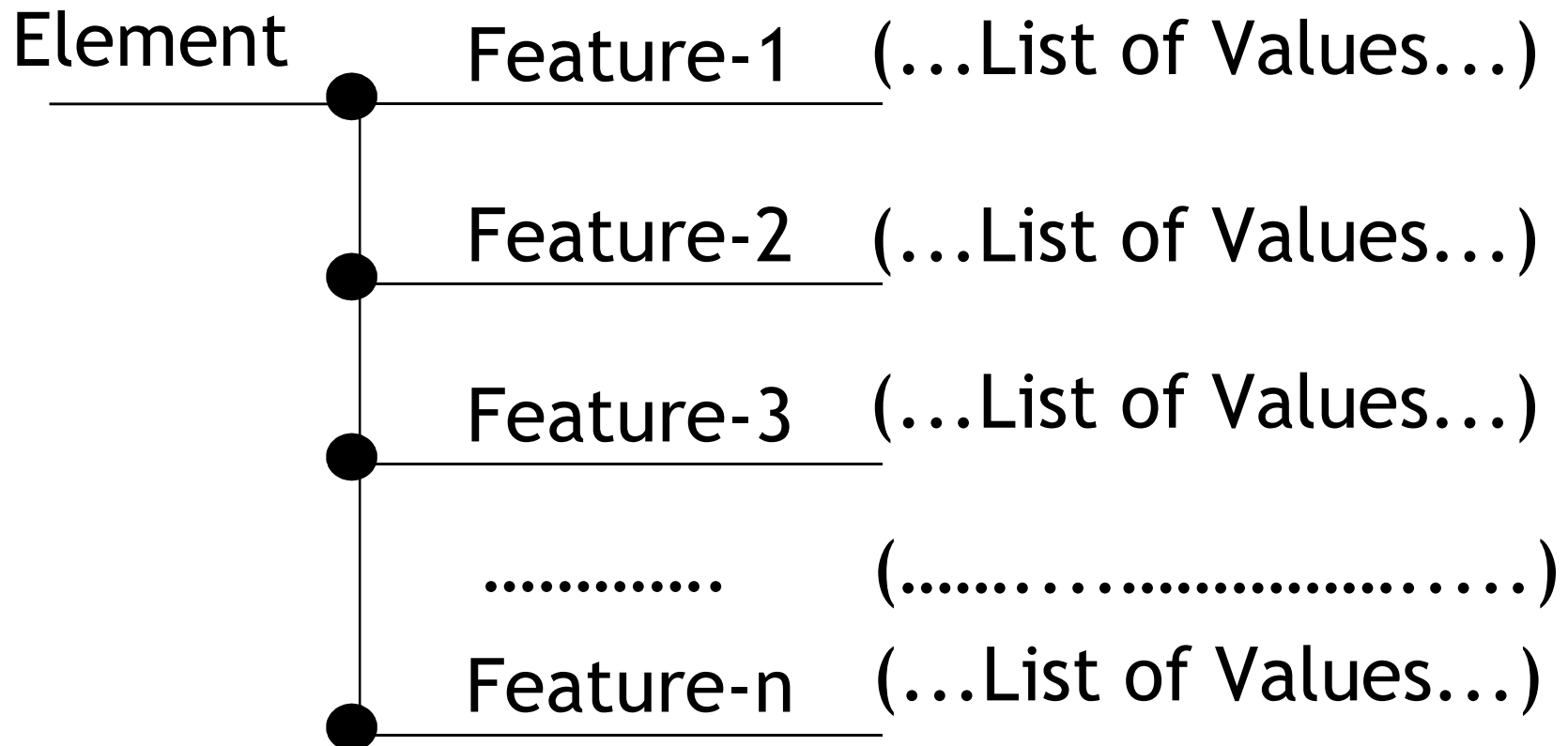0   5   10   15   20   25

Total: 21 answers

Hongyul Yoon:
"I have been thinking how to describe the axioms better in order to make them clearer for the general public."

The ENV Model
«Element – Name of feature – Value of feature»

ENV Model: Element – Name (of feature) – Value (of feature)

Element

Feature-1 (...List of Values...)

Feature-2 (...List of Values...)

Feature-3 (...List of Values...)

.... (.......….................……)

Feature-n (...List of Values...)

Feature -1

Feature -2

Feature -3

Feature -4

Feature -5

Feature -6

Feature -7

- He learnt TRIZ from G. Altshuller

- He is a TRIZ Master

- He was a General Manager in TRIZ School

- He was a Co-founder in Inventive Machine Lab

- He worked in South Korea, France, and Germany

- He created a new line for TRIZ development

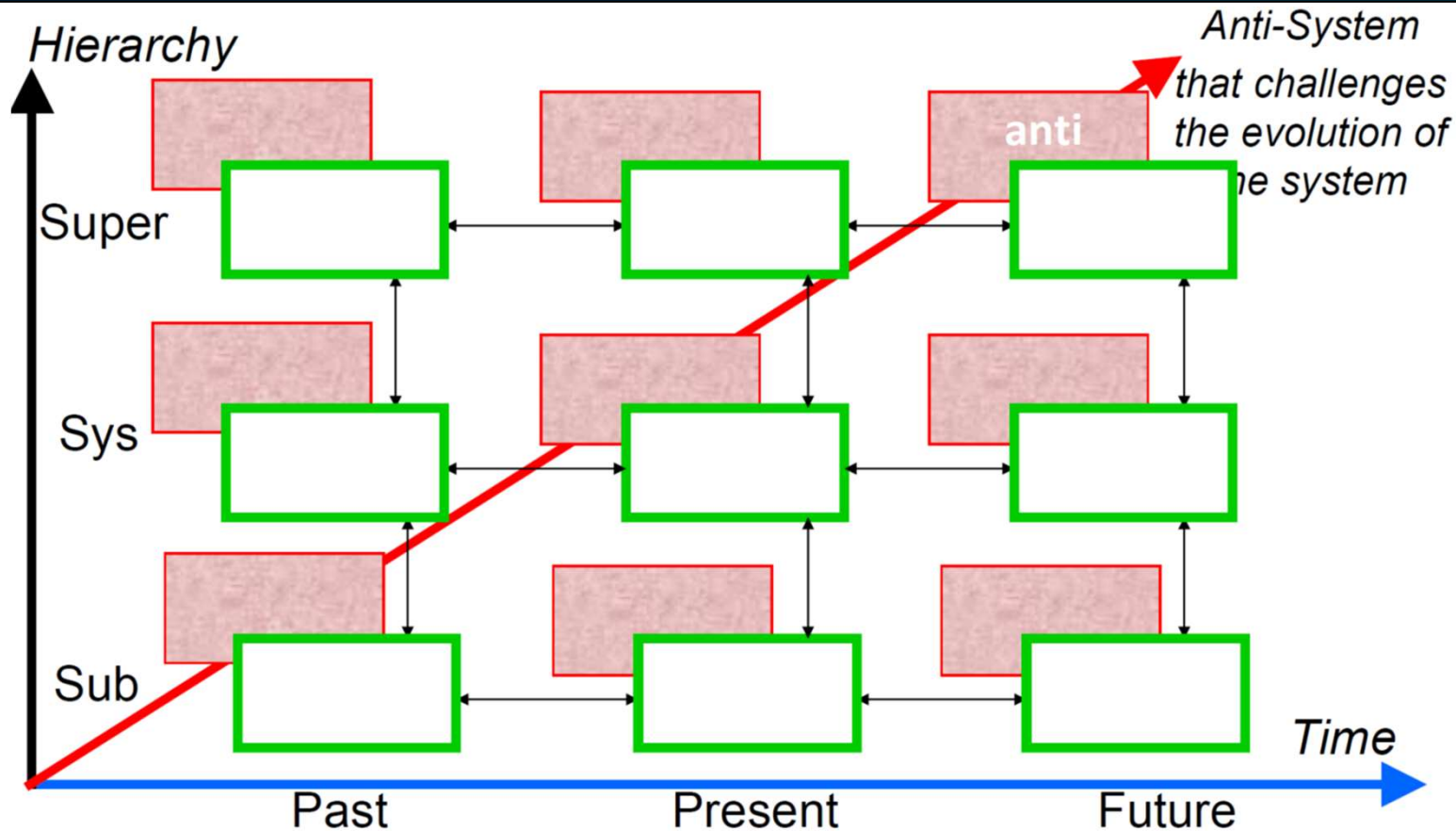- You listen to the presentation about his heritage

\<Element\>

What is your opinion about the ENV Model?

Total: 21 answers

The OTSM Advanced Scheme of Powerful Thinking
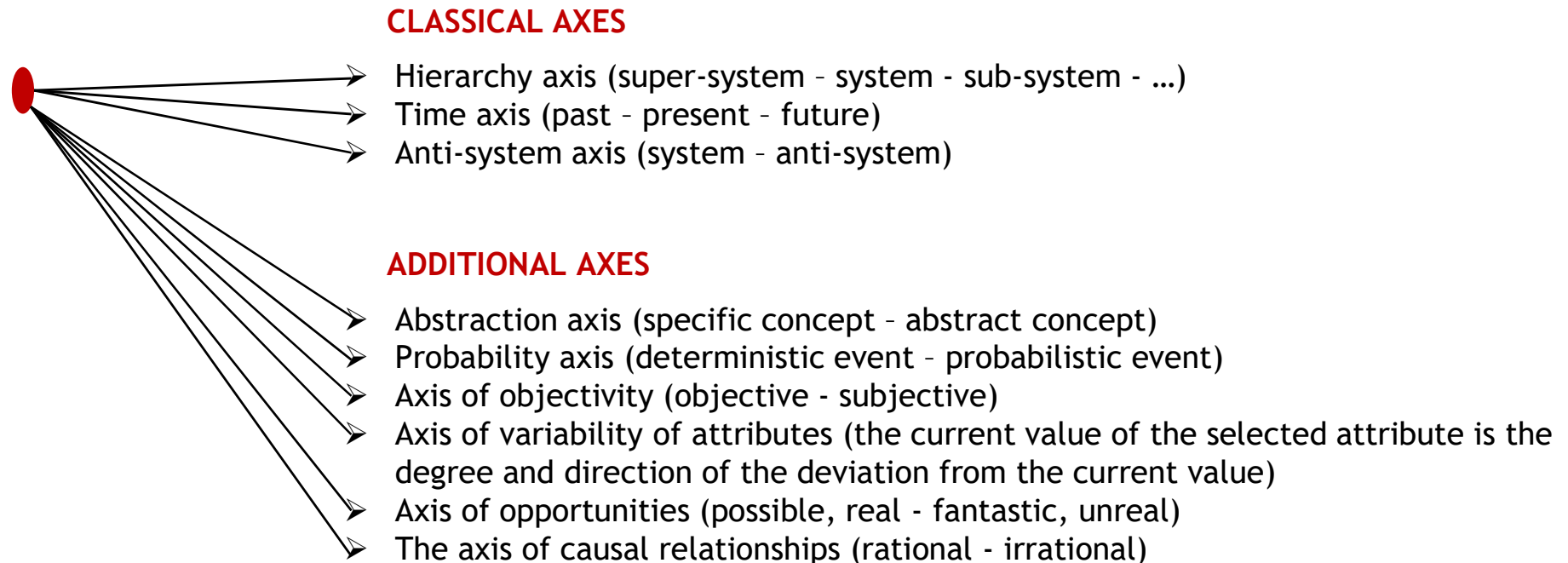
Altshuller's Scheme of Powerful Thinking

Multi-screen diagram is useful for:
- the analysis of available resources in the system;
- the analysis of problems in the system and their interdependences with problems in super- and sub systems;
- capturing simultaneously a lot of objects for the analysis (overcoming the limit of the attention span of 5+/-2 objects).
- the analysis of a problem in its interconnectedness with other problems

© Khomenko N.N. Advanced multi-screen schema of powerful thinking. (in Russian) Деп. в ЧОУНБ 15.03.13 № 3566
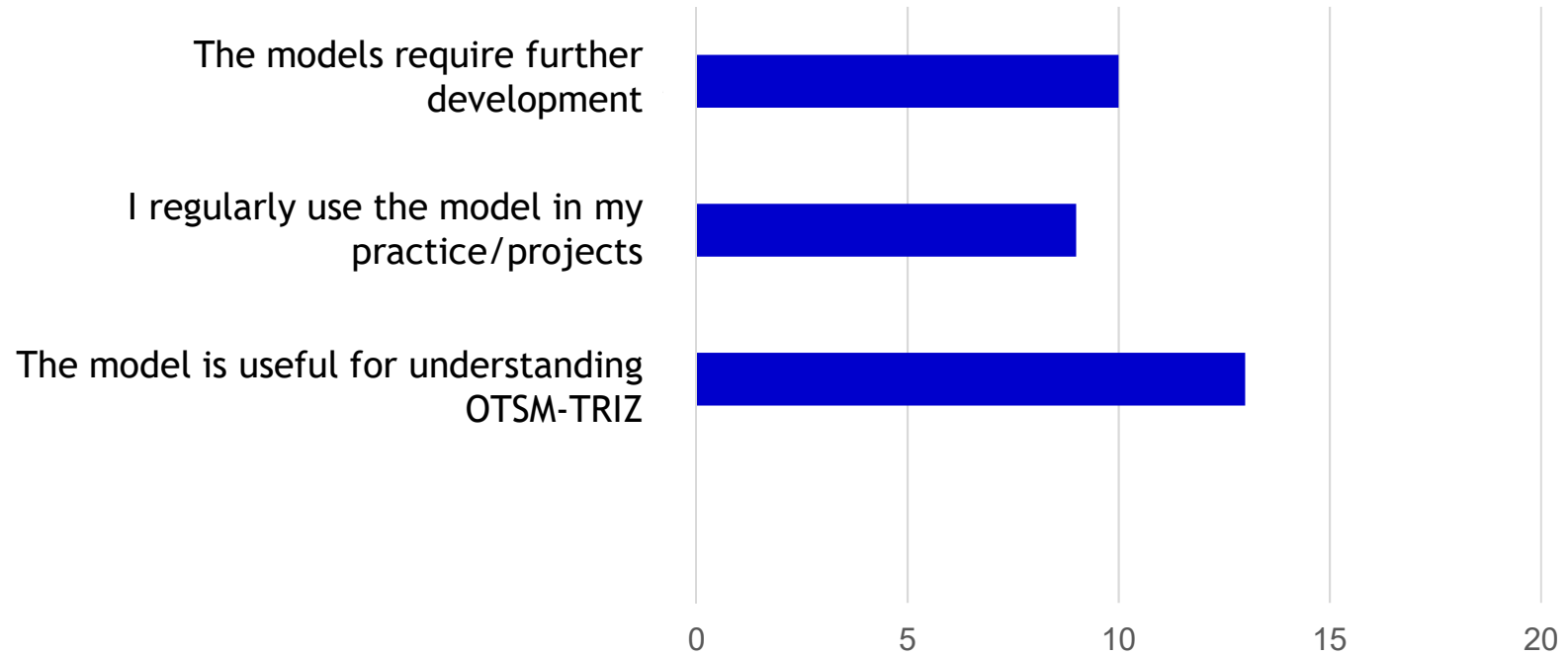
The Advanced Scheme of Powerful Thinking

The function of the Advanced scheme of powerful thinking (multi-screen model) is to support the analysis and the problem-solving process.

CLASSICAL AXES

➢ Hierarchy axis (super-system – system - sub-system - ...)
➢ Time axis (past – present – future)
➢ Anti-system axis (system – anti-system)

ADDITIONAL AXES

➢ Abstraction axis (specific concept – abstract concept)
➢ Probability axis (deterministic event – probabilistic event)
➢ Axis of objectivity (objective - subjective)
➢ Axis of variability of attributes (the current value of the selected attribute is the degree and direction of the deviation from the current value)
➢ Axis of opportunities (possible, real - fantastic, unreal)
➢ The axis of causal relationships (rational - irrational)

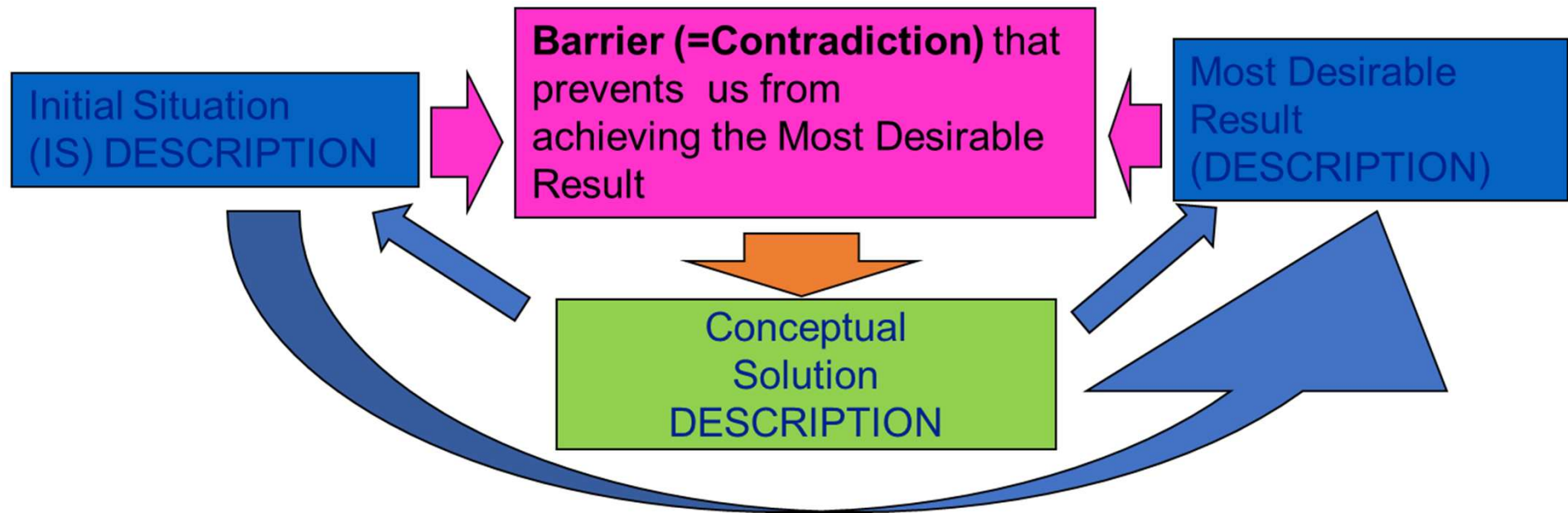# What is your opinion about the Advanced Scheme of Powerful Thinking?

Total: 21 answer

The «Tongs» MODEL
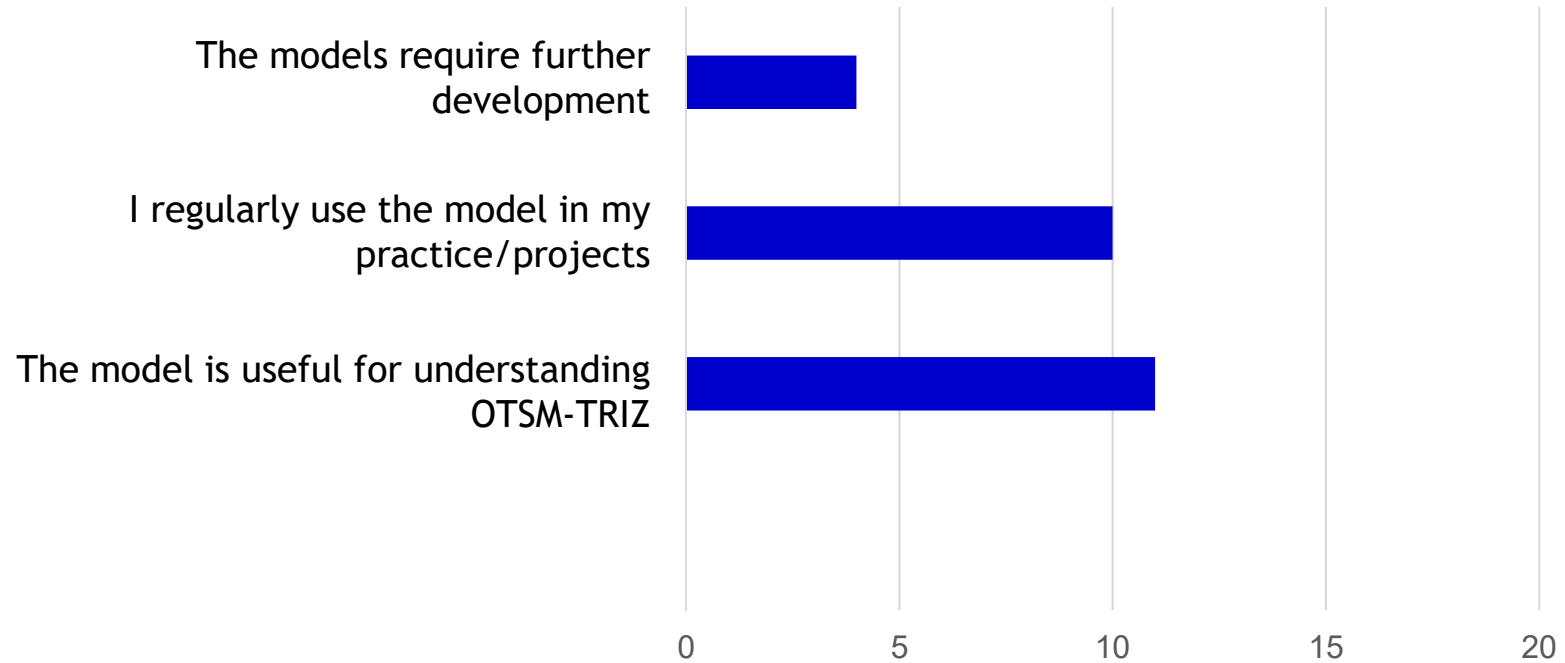# Process of Inventive problem solving

A specific barrier we should overcome is the root of a specific problem.
The root of the barrier is a hidden CONTRADICTION.

What is the root of a contradiction?

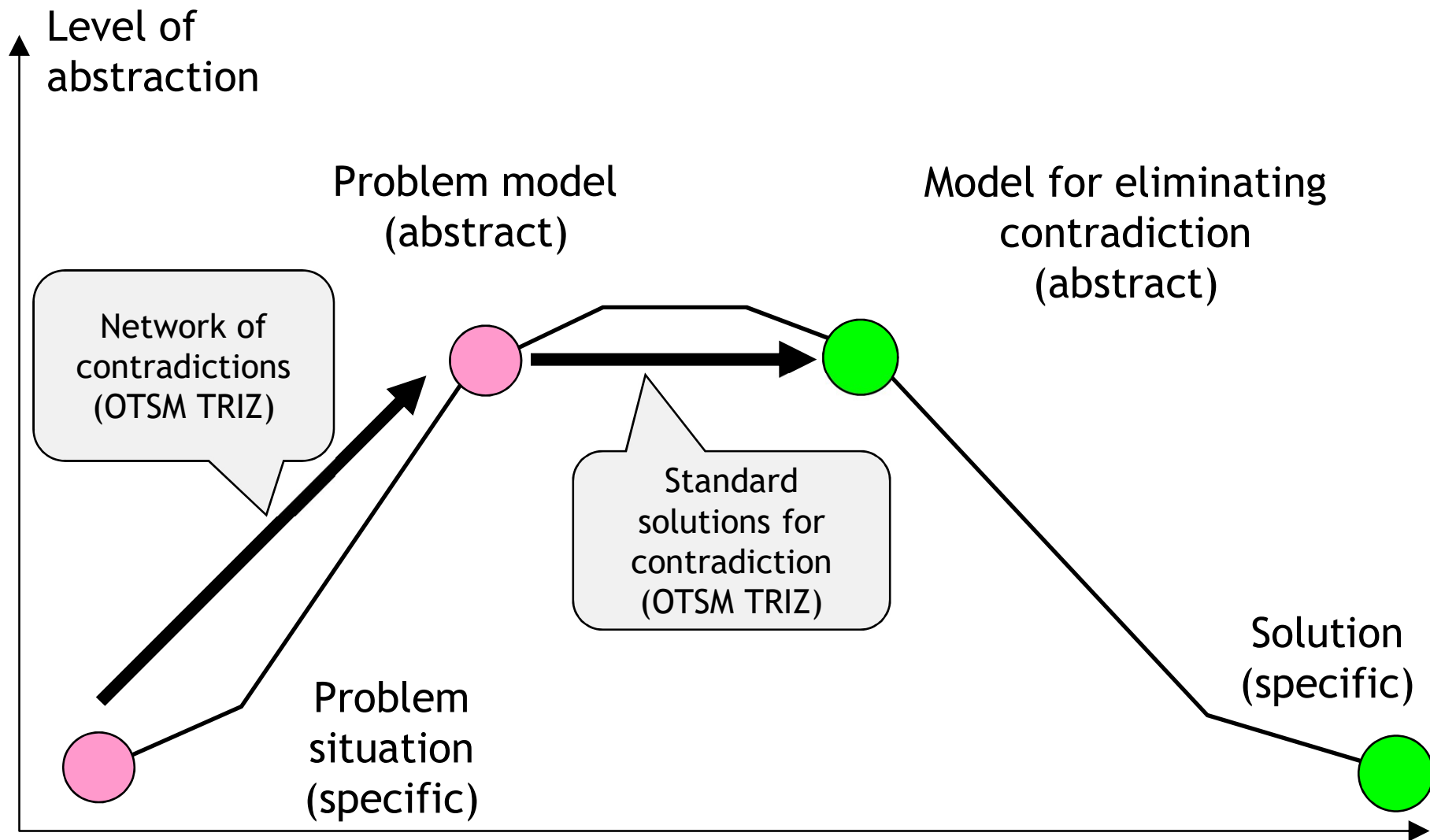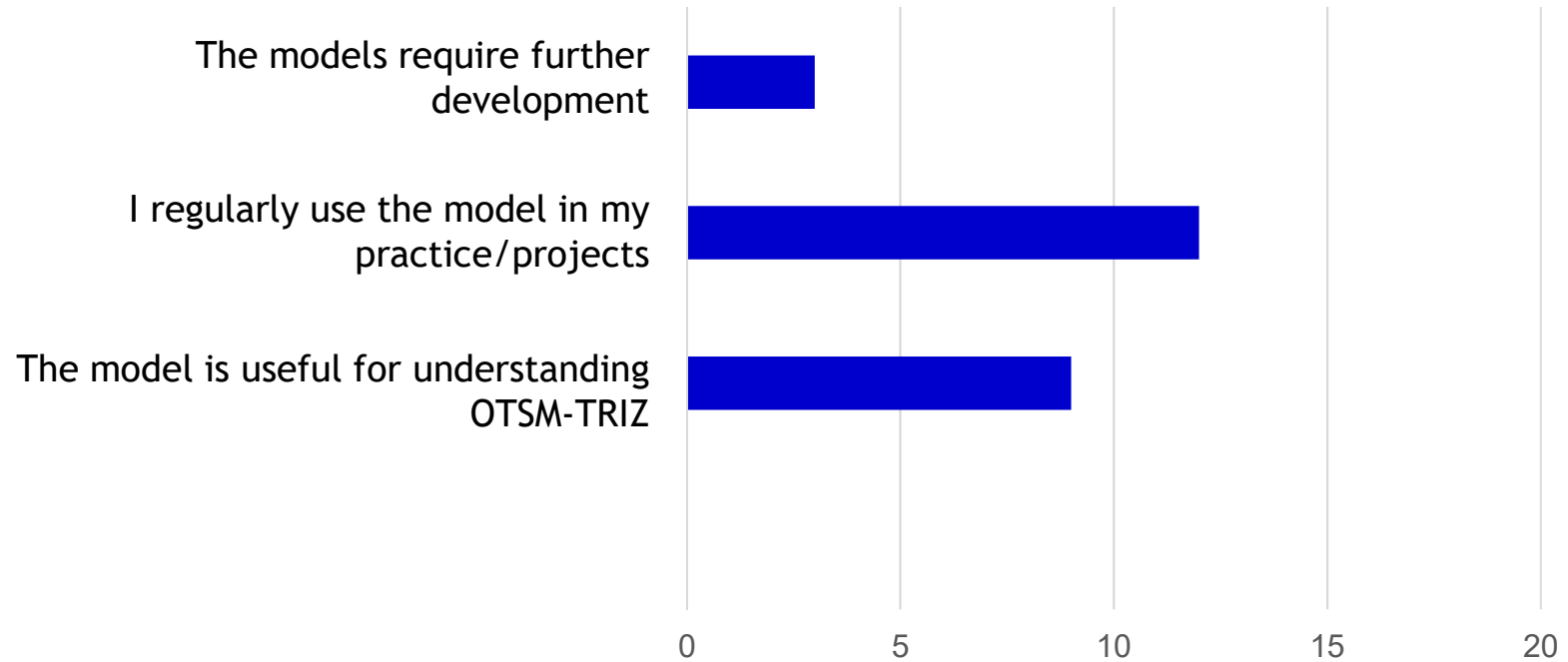# What is your opinion about the "Tongs" model?

Total: 21 answer
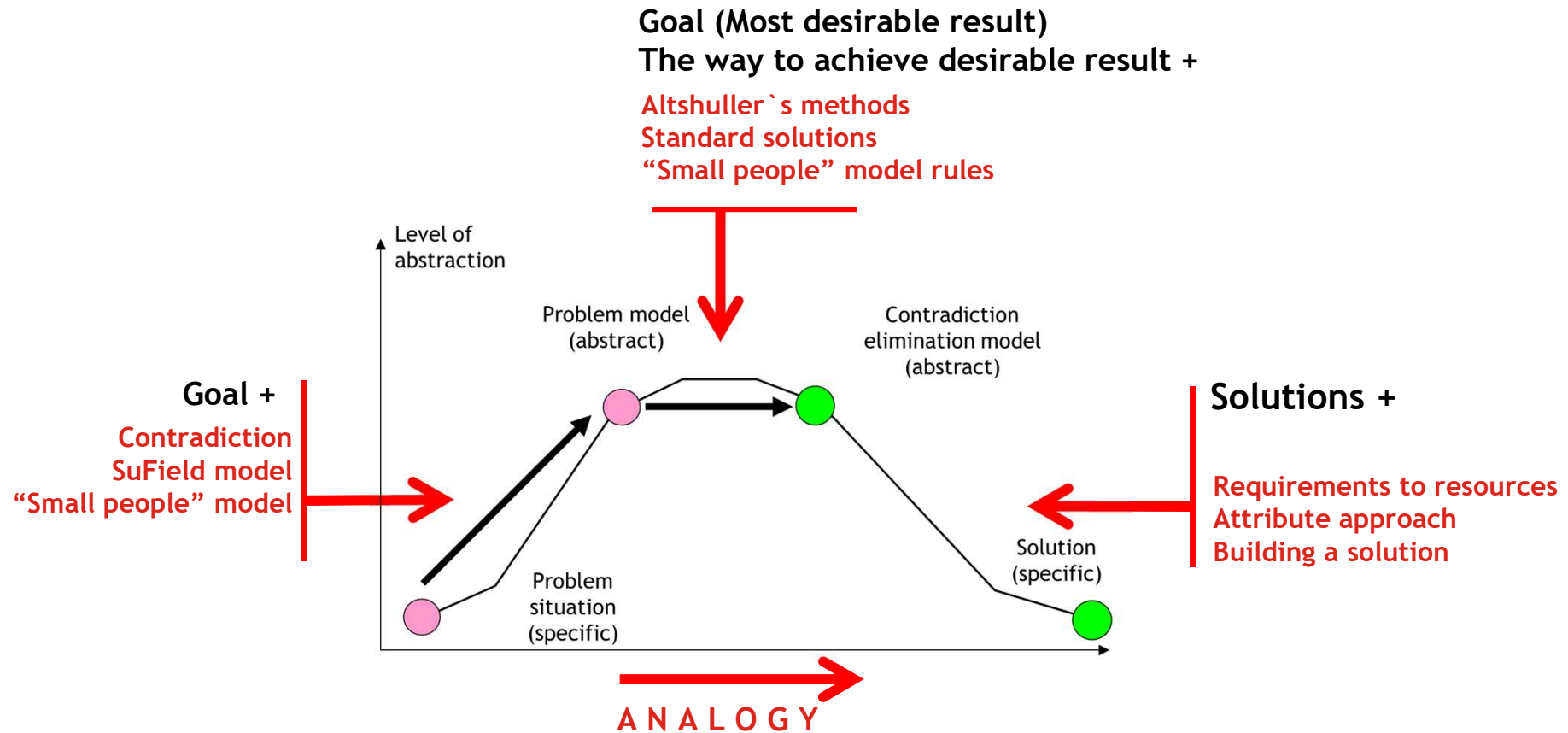
The «Hill» MODEL
Process of Inventive Problem solving

Level of abstraction

Problem model (abstract)

Model for eliminating contradiction (abstract)

Network of contradictions (OTSM TRIZ)

Standard solutions for contradiction (OTSM TRIZ)

Problem situation (specific)

Solution (specific)

What is your opinion about the «Hill» model?

Total: 21 answer

Goal (Most desirable result)
The way to achieve desirable result +

Altshuller`s methods
Standard solutions
"Small people" model rules

Level of abstraction

Problem model (abstract)

Contradiction elimination model (abstract)

Goal +

Contradiction
SuField model
"Small people" model

Solutions +

Requirements to resources
Attribute approach
Building a solution

Problem situation (specific)

Solution (specific)

A N A L O G Y

The «Funnel» MODEL
Process of Inventive Problem solving

From problem to useful solution

Problem

Problem

Ideal Final Result

Human

Line of Contradictions

Line of Resources

Nature

Useful solution

Solution

What is your opinion about the «Funnel» model?
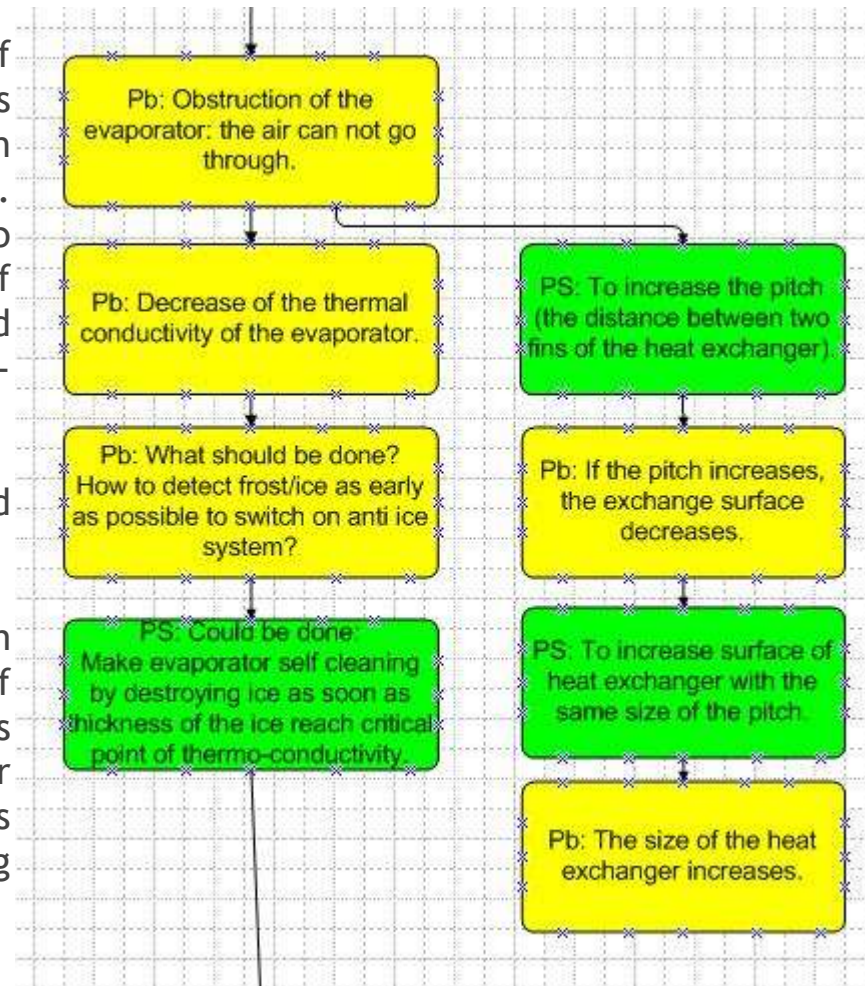
Total: 21 answer

The technology «Network of problems»

The technology "Network of problems" («Network of Problems/Solutions")

...When we have general criteria for evaluation of obtained solutions we can decompose some problems and solutions. Sometimes a problem description contains a description of partial solutions as well. Other problem descriptions show that they are sub problems that appear as a result of implementation of certain partial solutions. Some partial solutions could be decomposed into several partial solutions or a sub-network of problems and partial solutions.
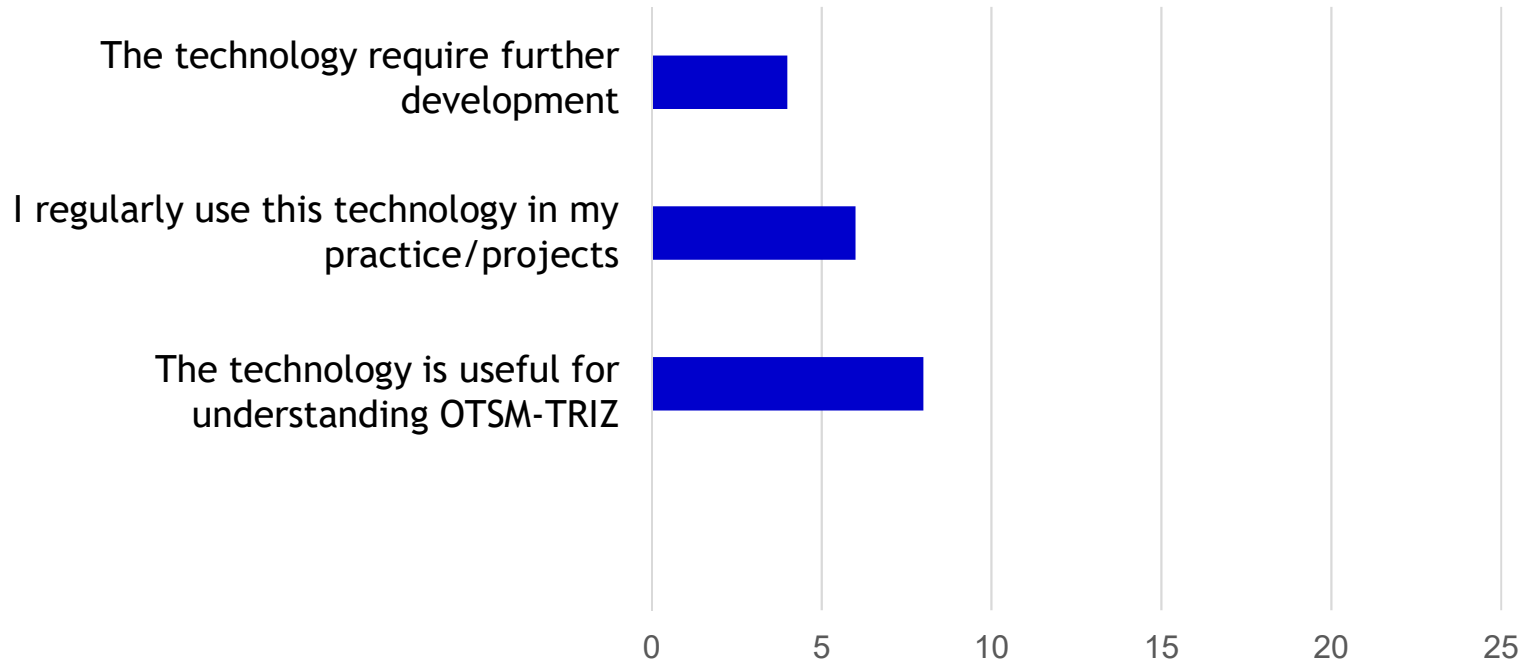
All of these sub-graphs should be properly integrated into initial Network of Problems.

After some practice, the decomposition of problem and solution nodes could be done on earlier stages of the development of the nitial Network of problems and even during the stage of collecting problems for the list of initial problems. But at the beginning it is useful to focus on the decomposition after organising the Goal Nodes into a system...

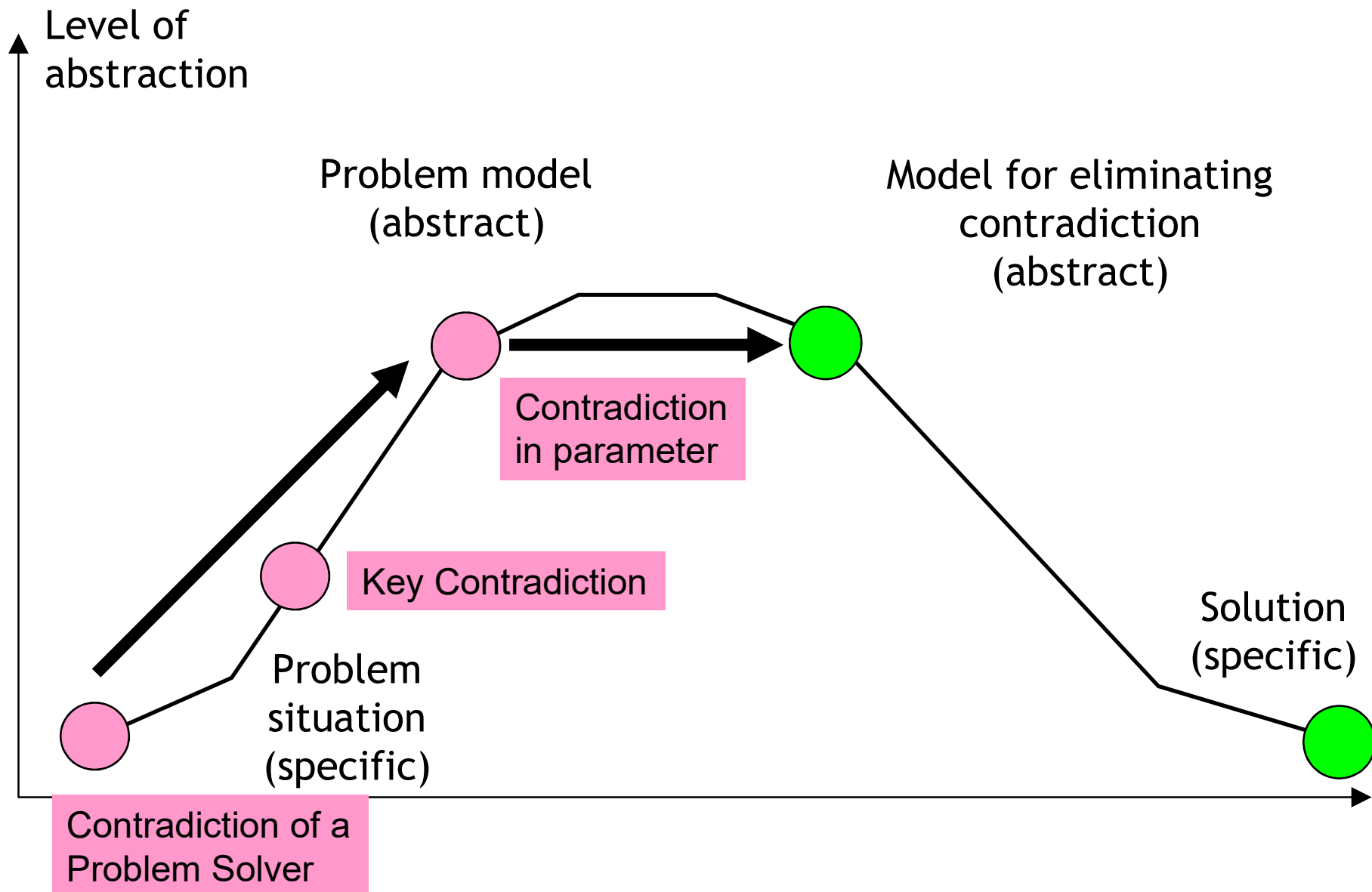# What is your opinion about the «Network of Problems» (NofP) technology?
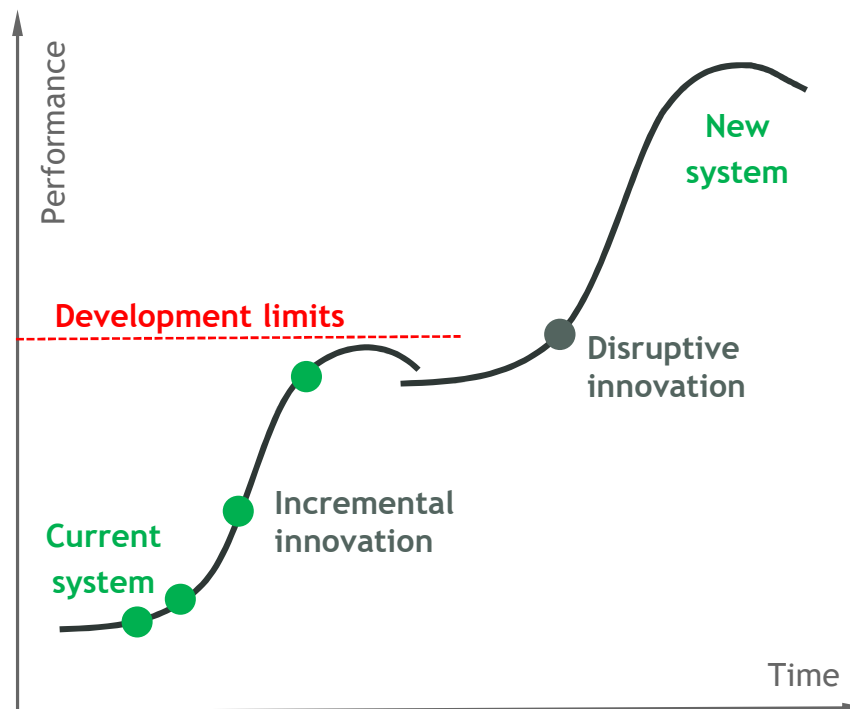
Total: 22 answers

The technology require further development

I regularly use this technology in my practice/projects

The technology is useful for understanding OTSM-TRIZ

0   5   10   15   20   25

The technology «Network of contradictions»

The "Contradiction" technology

Level of abstraction

Problem model (abstract)

Model for eliminating contradiction (abstract)

Contradiction in parameter

Key Contradiction

Problem situation (specific)

Solution (specific)

Contradiction of a Problem Solver

The Key (driving) contradiction

*A **key contradiction** determines the evolution of a class of systems.*
Once we solve this contradiction we improve a system radically. In some cases the elimination of the key contradiction results in the emergence of a new class of systems.

© Khomenko N.N. Materials for technology "Contradictions" (in Russian). Деп. в ЧОУНБ 20.02.2014 № 3606с

© Clayton M. Christensen. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail (Management of Innovation and Change). Harvard Business Review Press, 2013.

Elementary contradictions

1. Separation of parameters

Sub-parameter 1 should have value A, to ensure the effect E1;
Sub-parameter 2 should have value non-A, to ensure the effect E2.

2. Operational zone (macro- & micro-level)

In operational zone 1 the parameter should have value A, to ensure the effect E1;
In operational zone 2 the parameter should have value non-A, to ensure the effect E2.

3. Operational time (macro- & micro-level)

In one time period the parameter should have value A, to ensure the effect E1;
In other time period the parameter should have value non-A, to ensure the effect E2.

4. System hierarchy levels

On one system hierarchy level the parameter should have value A, to ensure the effect E1;
On the other hierarchy level the parameter should have value non-A, to ensure the effect E2.
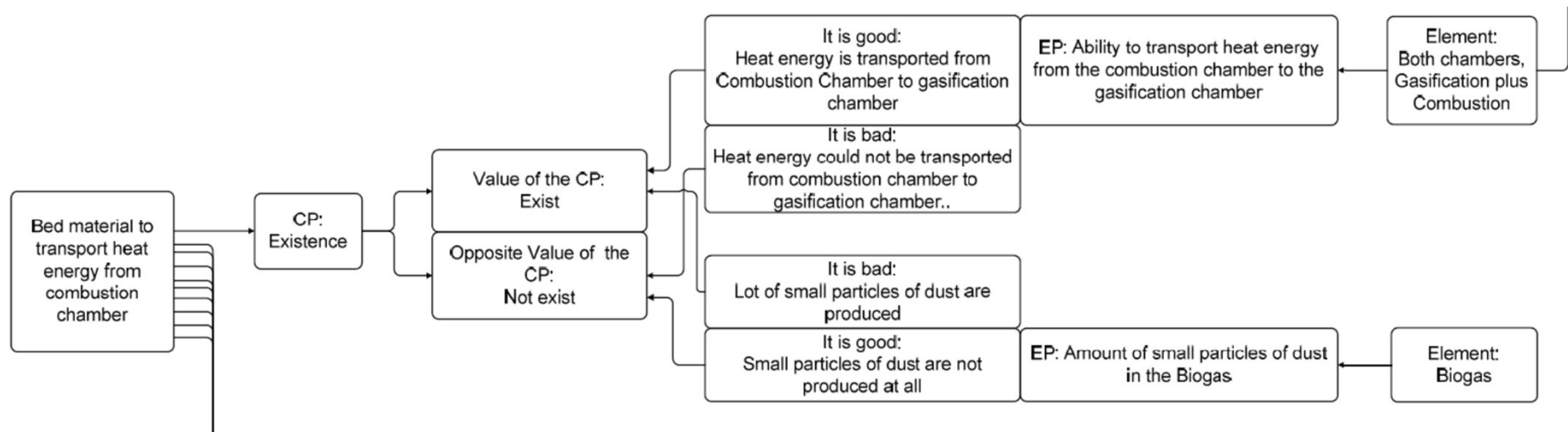
5. Different prototype (alternative system)

In a basic system the parameter should have value A, to ensure the effect E1;
In an alternative system the parameter should have value non-A, to ensure the effect E2.
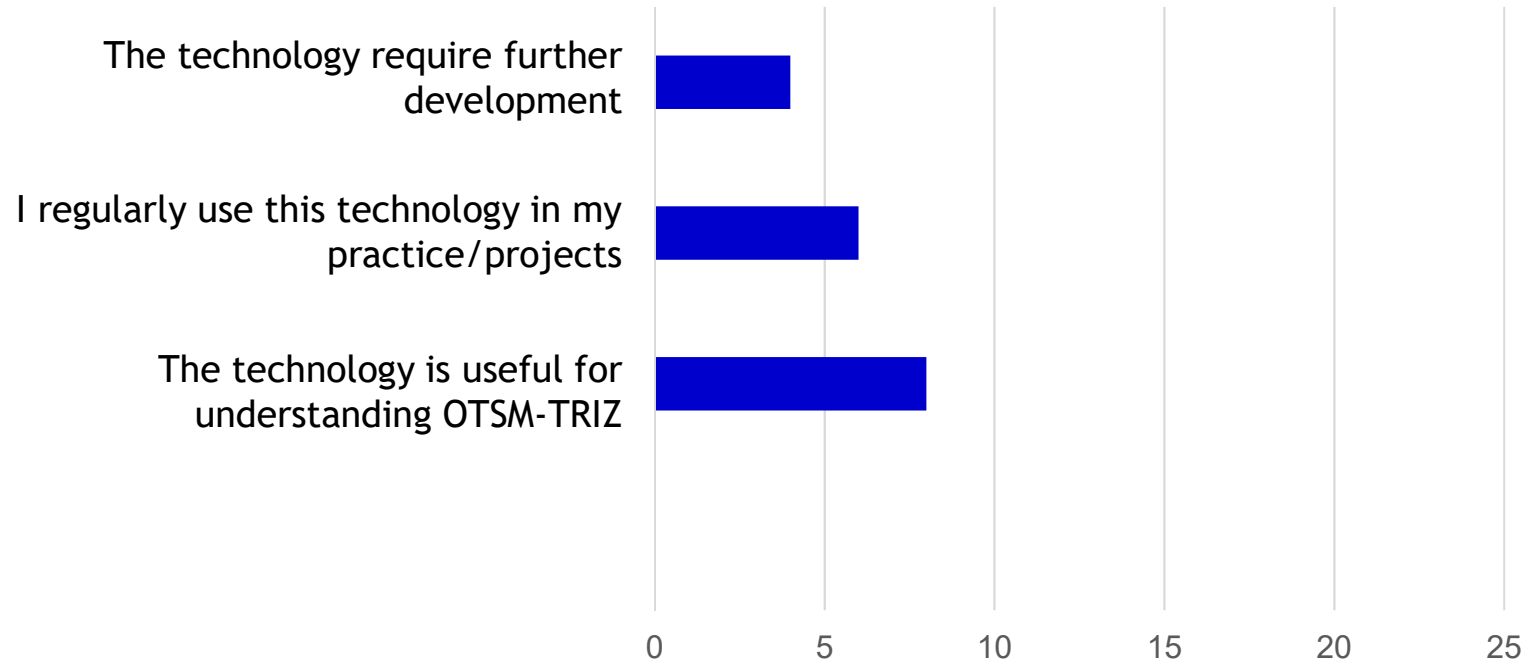
6. Imitation (copy)

The original system possesses all the properties; the copy possesses only the subset of properties needed to solve the problem.

What is your opinion about the «Network of contradictions» technology?

Total: 22 answers

The technology "Network of parameters"
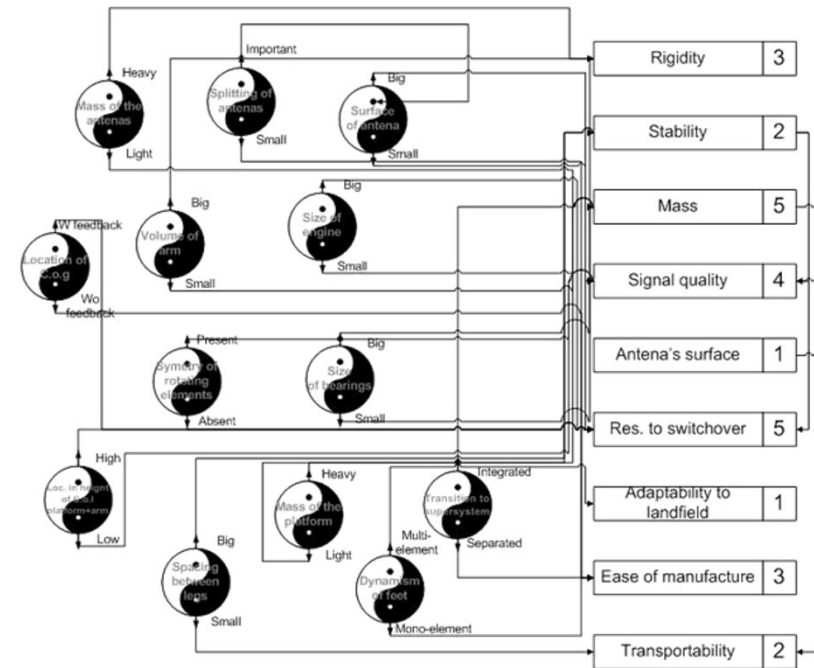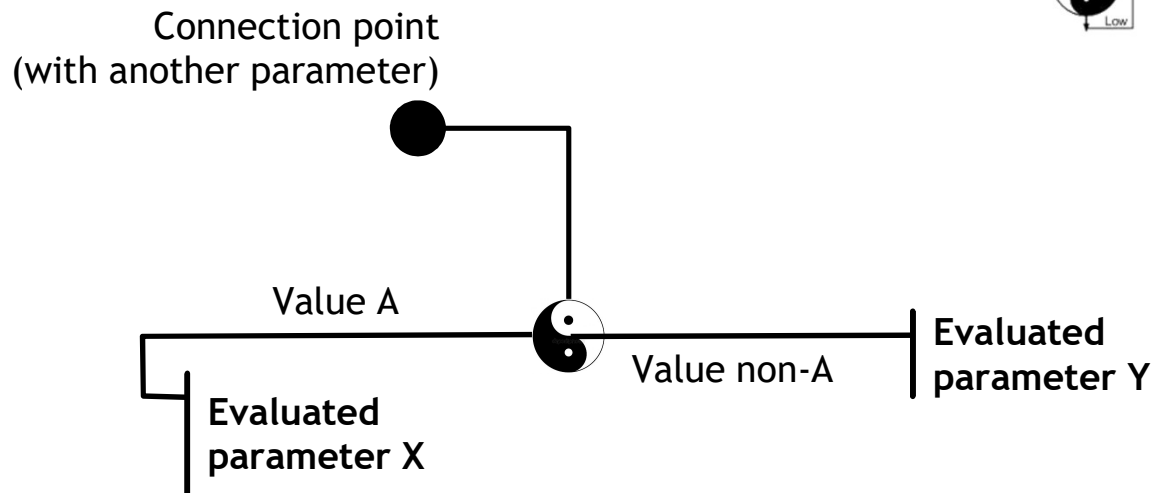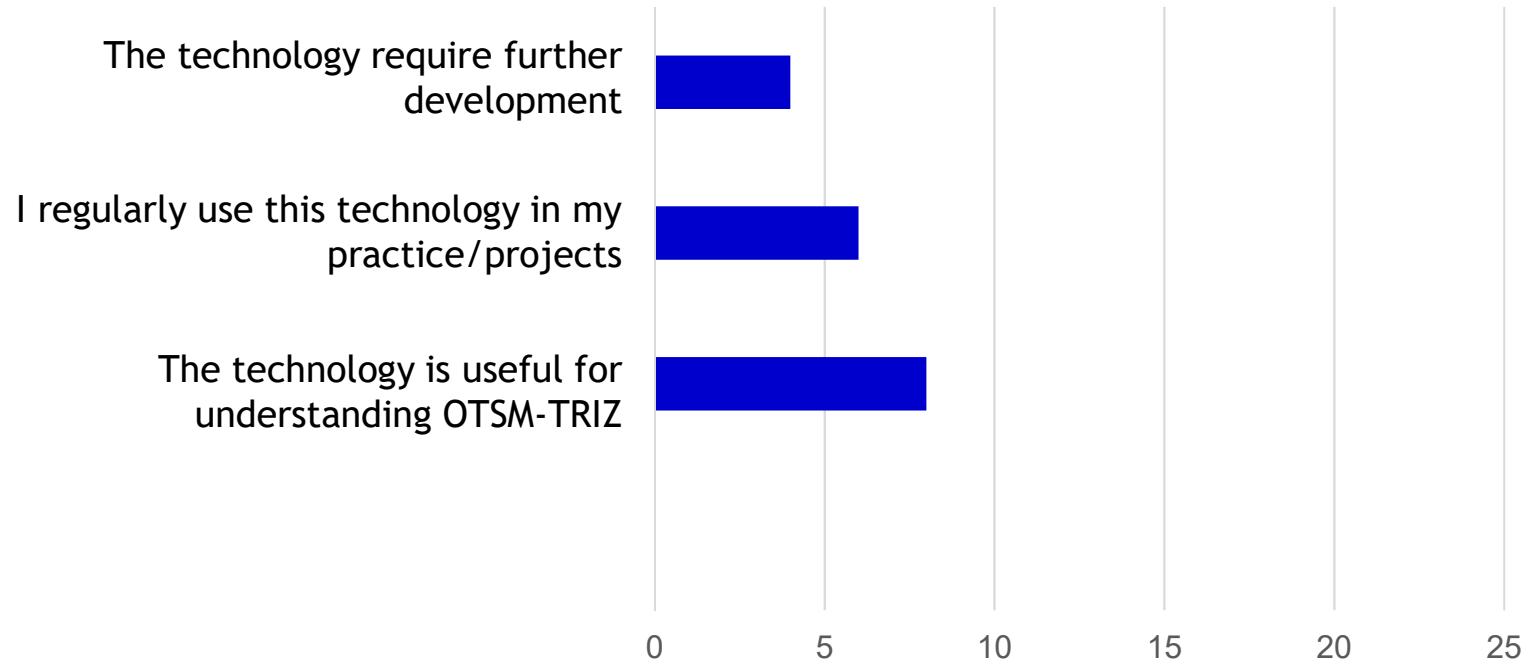
...When there is a set of contradictions or their network, we can proceed to the following transformation of the description of the initial problem situation: transition to a network of parameters.

First, in the right-hand sides of the contradictions we can detect the so-called evaluation parameters, i.e. parameters that allow to evaluate the quality and/or performance of the system...

Connection point
(with another parameter)

Value A

Value non-A

Evaluated parameter Y

Evaluated parameter X

What is your opinion about the "Network of parameters" technology?

Total: 22 answers

The technology "Line of solutions"

The technology "Line of Solutions"

Input: the initial problem statement including an undesirable effect

Conceptual solution

Partial conceptual solution	Ideas that appeared during the analysis stage
Integrated conceptual solution	Ideas that appeared during the synthesis stage
Final conceptual solution	Solution that is tested by computational simulations

Prototype — Solution that is tested as a prototype and is feasible

Implemented solution — Solution that is accepted and implemented

© N. Khomenko and D. Kucharavy, "OTSM-TRIZ Problem Solving Process: Solutions and Their Classification," in TRIZ Future 2002, 2002.

What is your opinion about the "Line of Solutions" technology?

Total: 22 answers

Bar chart data:

- The technology require further development: 4
- I regularly use this technology in my practice/projects: 6
- The technology is useful for understanding OTSM-TRIZ: 8

(horizontal axis: 0, 5, 10, 15, 20, 25)

OTSM TRIZ component	It is useful for understanding OTSM-TRIZ	I use it in practice / projects	It requires further development
OTSM TRIZ Axioms	ϒ	ϒ	
ENV model	ϒ	ϒ	
Advanced Multi-screen model	ϒ		ϒ
«Tongs» model	ϒ	ϒ	
«Hill» model		ϒ	
«Funnel» model			
«Problem Network» technology	ϒ	ϒ	ϒ
«Contradictions Network» technology			
«Parameters Network» technology			
«Line of solutions» technology			

ϒ Means that more than 50% of the participants answered positively to the question
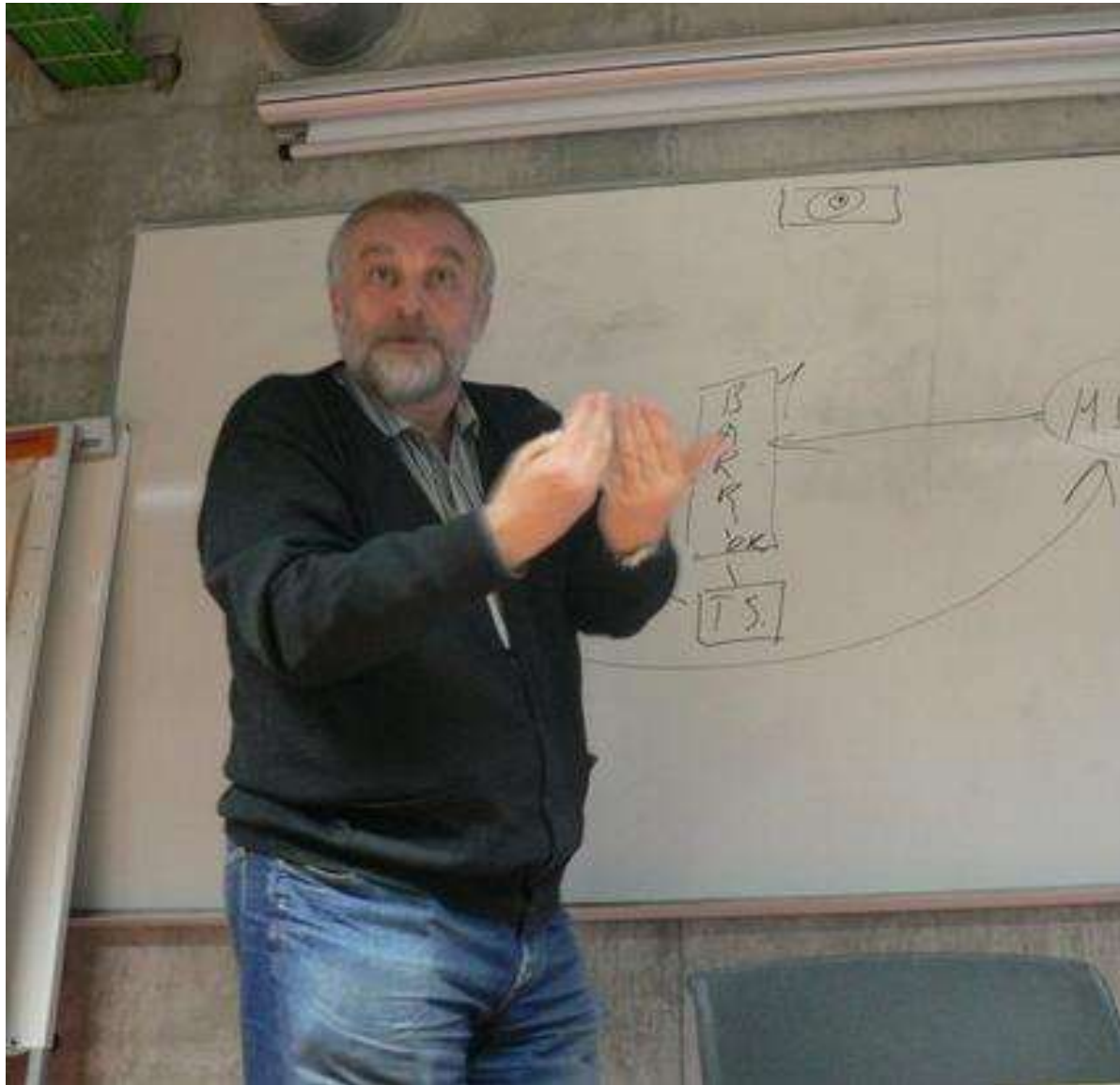
CONCLUSION

- Studying radio engineering in the former USSR.
- Working at the Institute of Agricultural Machinery.
- Collapse of the USSR, as a consequence, not being demanded professionally.
- Forced emigration with family to Canada.
- Severe disease in the last years of life.

1. **A valuable goal:** acquaintance with TRIZ; meeting the author of TRIZ G.S. Altshuller; participation in the Invention Machine project ; creation and development of OTSM-TRIZ
2. **Leadership**: pioneer, talented in inspiring and attracting people
3. **Some results**: Minsk TRIZ School, the Invention Machine project, the first TRIZ website (trizminsk.org), a new line in TRIZ development - OTSM-TRIZ, the Jonathan Livingston project, a breakthrough with OTSM-TRIZ in South Korea and in Europe, dozens of students and followers
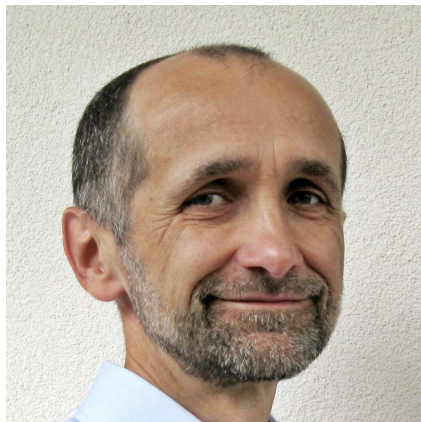
About the authors of the presentation

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TRIZ specialist since 1987. Co-founder of IMLab,
teammate of the Invention Machine project.
TRIZ Developer: Value-Conflict Mapping Plus, TRIZ
navigator for business models.

He has over 30 years of experience in IT, including 11
years in the field of business analysis.

Dmitry KUCHARAVY – is a research engineer (Strasbourg, France). He
has over 25 years of practical and research experience in
applying Inventive Problem Solving as engineer,
researcher, consultant, and teacher. Currently he
combines practical consulting with teaching and
research in the domain of forecasting methods and
strategic system planning (author and developer of a
Researching Future methodology).

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